40 Rock

# POPULAR Computing WEEKLY

35p 30 December 1982 Vol 1 No 36

## This Week



## News Desk

Prime Minister Margaret Thatcher

# IT — the race we must not lose

THE Prime Minister, Margaret Thatcher has warned, that many jobs will be lost if Britsh companies do not adopt information technology and compete successfully with other countries

Speaking at the opening of the IT '82 Conference at the Barbican Centre in London she said "If we lose this race (to adopt new technology) we shall be priced out of not just particular products or processes, but out of whole industries

"The Japanese electronics industry alone is now producing goods worth more than £9bn a year Nothing can stand in the way of a similar success story in the UK except ourselves" she said

In her address Mrs Thatcher drew attention to the "outstanding success" of Sinclair Research The company is ex-

Continued on page 5

## Ace comes up trumps

FORTH goes to the high-street as the only low-cost micro to use the language — the Jupiter Ace — begins to be sold retail

From mid-December the machine has been available through specialist microcomputer retailers and selected branches of Laskys and Debenhams

The machine is being sold at £89 95 complete with manual, demonstration tape and the necessary leads Previously it has only been available by mail-order

Michael Scott, managing director of Micro Marketing who are handling its distribution said "All production until mid January has been accounted for and production is being stepped up to almost double

"We are looking to take 25 percent of the market for micros costing under £100" he said

In January the company will also be marketing a range of games and utility software for the Ace

## Classified

 Continued on page 29


*****SPECTRUM AND ZX81 SOFTWARE*****
CP SOFTWARE
Specialists in high quality intelligent games
CP SOFTWARE
Dept CPW
17 Orchard Lane, Prestwood,
Great Missenden, Bucks HP16 0NN




30 December 1982 Vol 1 No 36

## The Team

**Editor**
Brendon Gore

**News Editor**
David Kelly [01-930 3271]

**Sub-editor**
Ninette Sharp

**Editorial Secretary**
Theresa Lacy

**Advertisement Manager**
David Lake [01-839 2846]

**Advertisement Executive**
Alastair Macintosh [01-930 3260]

**Managing Editor**
Duncan Scot

**Publishing Director**
Jenny Ireland

*Popular Computing Weekly*
Hobhouse Court 19 Whitcomb Street
London WC2
Telephone **01-839 6835**

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**How to submit articles**
Articles which are submitted fo publication should not be more than 3 000 words long The articles and any accompanying programs should be original It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted

All submissions should be typed and a double space should be left between each line Please leave wide margins

Programs should whenever possible be computer printed

We cannot guarantee to return every submitted article or program so please keep a copy If you want to have your program returned you must include a stamped addressed envelope

**Accuracy**
*Popular Computing Weekly* cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

## This Week





## Editorial

Those of you who have been watching Shogun will be familiar with the story of Captain John Blackthorn, the 16th century Englishman who goes to Japan and becomes a Samuri

Twentieth-century Japan the land of the rising micro, is a very different world to its 16th century counterpart Today's Samuri is more likely to be a corporate salesman, selling cars and electronics goods to the rest of the world

Instead of moaning at Japan's success, we should be selling our goods to them Sinclair via an agreement with Mitsui, is the only British manufacturer selling micros to the Japanese in any quantity And even Sinclair is not doing as well as it might

Similarly, there are few, if any, British software houses selling their programs in Japan

There is a large potential market in Japan, for both micros and software But, to succeed in that market, British companies will have to go to Japan and actively sell their wares

The Japanese are not going to beat a path to our door It is up to us to adopt a Samuri approach

## Next Thursday

**Are you an arcade addict? Can you stop the aliens from penetrating your defences? Find out in Missile Command, a new game for the ZX Spectrum by Chris Wood.**

**Also next week, Kevin Griffiths explains how to transfer data from one program to another on a ZX81 And G Morton presents a graph plotting routine for the Dragon 32 which represents data on an x,y scale**



PIMANIA
A VERY MERRY CHRISTMAS & A HAPPY NEW YEAR

## Library fines overdue

I am writing to express an opinion which I know cannot be unique in the software business. In the last few months several 'software libraries' have come into existence, some of which have bought advertising space in your magazine.

These libraries make their living by buying commercial software and then hiring it out to anyone who wants it for a fee ranging from £1.50 to as little as 50p. I consider this hiring to be little short of a do-it-yourself piracy scheme, for the people running these libraries know full well that it is the easiest of tasks to link two cassette records (if the program cannot be broken into) or even to *Save* a borrowed program direct from the computer and then to send the cassette back to the library.

As far as I know, many (if not all) of these libraries do not pay any royalty whatsoever to the producers of the cassette for the privilege of lending out software that has taken large amounts of work and money to produce.

While I accept that some book libraries do not pay the publishers, this can in no way be used as an excuse by the software libraries. For a person to copy a 200 page book would cost between £5 and £10 in photocopies and a great deal of time on a conspicuous public photo-copying machine, whereas to copy a program worth £5 or more takes only a blank cassette (50p or less), a domestic tape recorder and a few minutes of your time.

Without the attraction of copies of the best commercial software for only £1 a time, I doubt very much whether some of these libraries could find enough customer support to stay solvent.

My criticism of this appalling situation is tempered with advice. I strongly urge that the following should be done before the 'library bandwagon' gets out of control.

(1) All software producers should follow Quicksilva's example and include in their cassette packaging the words "Unauthorised copying, hiring, lending, public performance and broadcasting of this cassette is prohibited".
(2) An association of software libraries should be formed. All member libraries would have to obtain permission from and negotiate a payment to the publisher (on a royalty basis or otherwise) of any program that they wished to lend.
(3) Any library who refused to join the association (the sole purpose of which would be to ensure 'fair play' between libraries and publishers) should be banned by the press from advertising the library in all microcomputer publications.

The above proposals are not as radical as they might seem. As a publisher yourself, you must know that the Advertising Standards Authority has worked particularly effectively over the years in all areas of the printed press, and anyone who 'steps out of line' (such as Mettoy with their 'Read this ad to your wife' advertisement) withdraws the offending advertisement on receipt of enough complaints.

I hope the above suggestions will be of some use in resolving the current situation of software libraries profiting too much from other people's work.

*David Webb*
*(Software Author)*
*Southholme*
*9 Park Road*
*Woking*
*Surrey GU22 7BW*

**This is an issue which is rapidly growing in importance. The number of software libraries springing up, which do not pay any sort of royalty for the cassettes they hire out, is alarming.**

**The legal position of these software libraries is unclear. The law, unfortunately, has yet to catch up with the micro revolution. And the government is unlikely to do anything in the immediate future.**

**As we said in our editorial of November 18 "Irrespective of the legal position, software libraries should be morally obligated to pay royalties (preferably at least 20 percent) to program authors".**

**David Webb has made a number of constructive proposals which, if followed, would do much to alleviate the problem. We would be very interested to hear readers' reactions to his proposals.**

**We also think that David Webb has inadvertently highlighted another problem. At the moment, software authors can only speak as individuals. They have no one to represent their interests.**

**Why not take a leaf out of the British Micro Manufacturers Association and form a British Micro Software Authors Association? Such a body could represent its members interests on such fraught questions as copyright and software libraries. And, where governments and companies tend to ignore individuals, they are often more receptive to organised pressure groups.**

## Dragon colour scheme

I bought my Dragon a few months ago now and have found out one or two useful things which are not in the manual that I think might interest you. If you want to print in red letters on an orange background, instead of the dreary old black on green, then try this little program.

```
10 REM"RED ON ORANGE"
20 PRINT "THIS IS IN RED ON AN
ORANGE BACKGROUND"
SCREEN 0,1
30 GOTO 30
```

As you can see it's the *Screen* command that does the work. If you have the print statement after the *Screen* it defaults to black on green.

Also, do you know of anybody who has started a Dragon Owners Club who would like at least one more member? PS For a fault in the Rom try 10 *CLS(J)* where *J=9*. The top of the screen prints out something that shouldn't be there!

*K Mockart*
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However, I discovered that if I used the L/H ear and the L/H speaker sockets and just turned the volume down while *Saving* it works perfectly and no unplugging leads. To *Load* just set the volume to normal.

I doubt it will work for all recorders as Sinclair explains in the booklet but it is worth trying even if it is to save that inevitable loose plug connection.

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*35 Stoveleigh Road*
*Solihull*

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Having just had a look through a friends' Spectrum manual, I feel I must tell you of a 'bug' in it. It's not a drastic error, though it's rather a stupid mistake which might cause a few red faces in Sinclair circles. Have a look at page six where you are shown how to set up the Spectrum. See it? The keyboard is not that of the Spectrum. Anyone with previous ownership of a ZX81 may recognise it. Yes folks, it's an '81 keyboard. Can anyone find a better 'boob'?

Another point. I have just bought issue 29 of *Popular Computing Weekly*. Where has the cover gone? What's happened to the full colour artwork? Without a decent cover *Popular Computing Weekly* looks like the *Beano*. Come on. Pull your socks up. This just isn't good enough.

PS. Bring back Citizen *Pain*!! (please)

*John McGuire*
*73 Tobermory Rd*
*Cathkin*
*Rutherglen*
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# LETTERS

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# Dim Nim

**A new game for Vic20 by Czes Kosniowski**

Dim Nim is a game for two players. As the name suggests, it is a disguised version of Nim.

On a chess or draughts board appear eight hearts and eight diamonds. One heart and one diamond in each row. The two players choose between hearts and diamonds.

Each player, in turn, chooses a row and moves his or her piece anywhere within that row — but without jumping over the opponent's piece. The game ends when the pieces in each row are next to each other. The player creating this state wins.

The piece that can be moved is flashing. You can move it by pressing

L for LEFT and/or
R for RIGHT

If you want to move a different piece instead, press

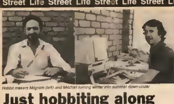
U for UP and/or
D for DOWN

When you have decided which piece to move and where to move it to, press *

The program will Run on any Vic20, expanded or not — line 11 takes care of the necessary changes. The many Rem statements explain the program.



```
1 REM      %%%%%%%%%%%%%%%
2 REM      %             %
3 REM      %  DIM  NIM   %
4 REM      %     BY      %
5 REM      %    CZES     %
6 REM      % KOSNIOWSKI  %
7 REM      %             %
8 REM      %%%%%%%%%%%%%%%
9 REM
10 REM %%%%%%%% SETTING UP %%%%%%%%%%%%%%%
11 G=PEEK(44)>=18 PF=7680+G*3584 GG=38400+G*512
12 DEF FNA(X)=PF+69+X*44+2*A(X)
13 DEF FNB(X)=PF+69+X*44+2*B(X)
14 G=0 V=36878
15 POKE V+1,26
20 REM %%%%%%%% DISPLAY %%%%%%%%%%%%%%%%%%
21 PRINT CHR$(147),"        DIM NIM".....
22 FOR I=1 TO 8
23 PRINT"   * * * * * * * *    "
24 NEXT
25 FOR I=0 TO 7
26 M=INT(4*RND(1))
27 N=INT((8-M)*RND(1))+M
28 IF M=N THEN 27
29 A(I)=M
30 B(I)=N
31 POKE FNA(I),83
32 POKE FNB(I),90
33 NEXT
34 PRINT CHR$(28),"L=LEFT  #=CHANGE  U=UP"
35 PRINT "R=RIGHT          D=DOWN",CHR$(19),CHR$(31)
40 REM %%%%%%%% FIRST PLAYER %%%%%%%%%%%%%%
41 R=200 GOSUB 101
42 GOSUB 81
43 S=3 T=0
44 POKE FNA(G),211
45 FOR I=1 TO 50 NEXT
46 POKE FNA(G),83
47 FOR I=1 TO 50 NEXT
48 GET G$
49 IF G$="U" AND G>0 AND T=0 THEN G=G-1
50 IF G$="D" AND G<7 AND T=0 THEN G=G+1
51 IF G$="L" AND A(G)>0 THEN POKE FNA(G),42 A(G)=A(G)-1 T=T-1
52 IF G$="R" AND A(G)<7 AND A(G)<B(G)-1 THEN POKE FNA(G),42 A(G)=A(G)+1 T=T+1
53 IF G$="#" AND T<>0 THEN 60
54 GOTO 44
60 REM %%%%%%%% SECOND PLAYER %%%%%%%%%%%%%
61 R=200 GOSUB 101
62 GOSUB 81
63 S=2 T=0
64 POKE FNB(G),218
65 FOR I=1 TO 50 NEXT
66 POKE FNB(G),90
67 FOR I=1 TO 50 NEXT
68 GET G$
69 IF G$="U" AND G>0 AND T=0 THEN G=G-1
70 IF G$="D" AND G<7 AND T=0 THEN G=G+1
71 IF G$="R" AND B(G)<7 THEN POKE FNB(G),42 B(G)=B(G)+1 T=T+1
72 IF G$="L" AND B(G)>0 AND B(G)>A(G)+1 THEN POKE FNB(G),42 B(G)=B(G)-1 T=T-1
73 IF G$="#" AND T<>0 THEN 40
74 GOTO 64
80 REM %%%%%%%% CHECK FOR WIN %%%%%%%%%%%%%
81 POKE 198,0
82 J=0
83 IF A(J)<>B(J)-1 THEN RETURN
84 J=J+1
85 IF J<8 THEN 83
86 R=200 GOSUB 101
87 R=230 GOSUB 101
88 R=200 GOSUB 101
89 IF S=3 THEN PRINT CHR$(19);"  FIRST PLAYER  WINS"
90 IF S=2 THEN PRINT CHR$(19),"  SECOND PLAYER WINS"
91 PRINT "  ANOTHER GO? Y OR N "
92 POKE 198,0
93 GET G$ IF G$="" THEN 93
94 IF G$="Y" THEN 20
95 PRINT CHR$(147)
96 END
100 REM %%%%%%%% NOISE %%%%%%%%%%%%%%%%%%%%
101 POKE V,15 POKE V-S,R
102 FOR L=1 TO 250 NEXT
103 POKE V-S,0 POKE V,0
104 RETURN
```



Hobbit makers Milgrom (left) and Mitchell turning winter into summer down-under

# Just hobbiting along

***David Kelly** talks to Alfred Milgrom and Philip Mitchell about* The Hobbit *— a new graphics adventure game*

An adventure program based on the story and characters of J R R Tolkien's book *The Hobbit*?

It sounds an impossible idea — the kind of program that could never hope to live up to users' expectations Yet strangely *The Hobbit* program (from Melbourne House for the 48K Spectrum) does manage to capture some of the magic and mystery of the original

In *The Hobbit* you take the role of Bilbo Baggins (neatly brushed feet are however not a prerequisite of playing the game) and attempt to steal the Dragon's treasure Accompanying you in your task you will discover Gandalf Thorin and many other characters from the Tolkien book

A unique feature of the game is that all the characters have independent lives of their own They are each capable of reaching their own decisions and acting with you or with each other, depending both on what you do and what they do

"It is much more than just another adventure game" explained Alfred Milgrom, Melbourne House publisher and co-author of the program "We looked at ordinary adventure games and decided that we wanted to do something that would go further and really stretch micros to the limit

"In all it took four of us eighteen months to write it Originally it was to have been for the TRS80 but when the Spectrum was announced it seemed an ideal vehicle for the program — the hi-resolution graphics and colour make all the difference to the way it looks

Philip Mitchell another of the group who developed the program continued "We had almost finished a basic TRS80 version when the Spectrum came out but because both machines are Z80-based there was very little conversion

"The program has been written in three very distinct parts First there is the English language analysis program, then the data base program that defines *The Hobbit* parts of the game and then there is a separate section which stores and generates the illustrations Converting to the Spectrum presented few problems as far

A dreadful drop to a dim valley awaits Bilbo

as the first two parts were concerned but since the TRS80 has no hi-resolution graphics or colour we had to start from scratch again with the illustrations

After the group had been working on the project for about six months, they approached the Tolkien Estate with a view to gaining permission to use the characters and story from the original book

"*The Hobbit* was always the project I wanted to do," says Alfred "I think it is the premier fantasy adventure in British literature and that's why we went for it We had some contingency plans if the Tolkien Estate could not give us permission to do it, but luckily they were delighted with the idea.

"The only stipulations they made were ones we were intending anyway For example they suggested that the program should only be available in a package including a copy of the book itself We had always thought this was a good idea, because that way you get clues on how to solve the adventure from the book. It also fills in many of the details we just didn't have space for in the 48K of Spectrum memory"

The program is taken directly from the book There are some 80 locations you can get into — 30 of which have an illustration There are 12 main characters in the adventure with lots of other animals and creatures in minor roles

Most of the work of translating the book into a story suitable for a computer program was undertaken by Veronica Megler She selected the locations that were to be used and worked out what sort of characters each of the creatures should have

An artist Kent Rees was commissioned to come up with a series of illustrations depicting Veronica's chosen locations Philip Mitchell then converted these illustrations into graphic pictures on the Spectrum

Tying the whole program together and making it work is the artificial language recognition program which links the player to the game "We were very fortunate to have the services of Stuart Ritchie who developed what he calls his Inglish program" explains Alfred "Stuart did a dual major in English Linguistics and Computer Science so he was really the ideal person to do it

"All the time when we were writing the program we had to be very conscious of memory space"

Philip eagerly explains "Usually in an adventure game most of the memory space is take up with word storage By dealing with words in a special way, using syntax constructions, we have been able to get down to an average of about two bytes per word

"We also spent a lot of time optimising the coding of the graphics illustrations This was somewhat complicated because we changed the screen format of the Spectrum Normally it shows 32 characters per line but because of the detail we wanted to be able to show we redesigned the character set to have 42 characters per line

"We have managed to store each picture in about 3-400 bytes ten to twelve times less than a complete screen full A range of different commands have been developed to economically produce different shapes and types of drawing on screen

"Kent Rees original paintings obviously contained more detail than we were able to show on the Spectrum and they had to be simplified but I don't think we were forced to leave out anything significant to *The Hobbit* story

"Developing the game has been a really strange experience" says Philip "At times it had a life of its own We'd be testing one part of the program and one of the other characters would just suddenly wander in The conversations we had with these creatures — people thought we were mad!

"It wasn't uncommon for Veronica to have difficulty in finding a particular animal she wanted to test the character and reactions of It would just have taken itself off to another part of the program, seemingly of its own accord!

After eighteen months, *The Hobbit* has now been completed. Because of the modular design of the project, a whole range of other adventures will also be possible using the basic *Hobbit* framework, but using different illustrations and text

"The next one shouldn't take that long," says Philip "At least I hope not — it's a very long time to work on one program

# Shark attack

***Mike Grece** takes a look at some of the latest Vic20 software.*

My first experience of a computer game was the Commodore version of Space Invaders (named *Avenger*) which was about the only software it was possible to buy when I purchased my Vic20 early this year. I can well remember the excitement I felt as I carefully plugged the cartridge into the back of the Vic and switched on — for over an hour I became hypnotised by the blips and explosions amidst a whirl of colour and speed as I struggled to defeat wave upon wave of menacing meenies descending the screen. Of course I never won, but the thrill of trying (and of beating my highest score so far) was all that mattered.

The software scene is completely different now. New games, new ideas, copies of old games, cassettes and cartridges seem to explode on to the pages of the magazines or into the classified ads and computer shops. When I began I had the choice of two games only — now it must run into several hundred. The difficulty is knowing which are worth buying and, perhaps more important, which are really fun to play. And that is where the role of a reviewer must be seen in perspective — for I can only describe what I like and what I find fun to play.

Let's start though with a survey of the games that seem to mimic Space Invaders, which I loosely term 'all speed and spacemen'. This category covers any game that involves shooting down aliens or steering cars along roads or moving something at speed to catch or avoid being caught. It's a pretty large category, but I use it to distinguish between what I shall term 'thinking games' or 'adventure games' which will be covered in later articles.

The main attraction of these speed and spacemen games is the skill required to manipulate a joystick or press appropriate keys. Brainpower is virtually eliminated in favour of reaction time. Devotees could criticise me on this last point, since a certain amount of thought is needed to progress from one level to another. But I am approaching the review from the viewpoint of a part-time player rather than a master.

The first two I tried were *Cosmiads* and *Vic Asteroids* from Bug Byte. Both are cassette-based, priced at £7.00 and are versions of arcade games.

I found both games slightly disappointing. *Asteroids* was the worst as I found it extremely hard to control the spaceship — represented by a white arrow and not very exciting to look at — and the asteroids themselves often did not break up when fired upon. The ship would steer itself erratically across the screen without responding to controls, and the overall quality of the graphics was poor.

*Cosmiads* on the other hand was an extremely slow version of *Galaxians*. It was possible to achieve very high scores indeed and the competitive aspect of the game soon palled. Add to that the factor that again the base ship would fire upon some of the aliens without achieving anything, and the cost of £7.00 for either of these seems to be too high. The only advantage with *Cosmiads* is that a slow player like myself can at least get a good score — but even I soon became bored.

Next on the list are two games from Romik Software. The range of Romik games is a little wider than Bug-Byte and the information on the sleeve a little fuller (but not much — a factor I feel could well be improved). Romik's advertisements contain the message 'Romik promise a minimum of one new game every month' — a promise that I hope they keep only providing the quality of the games is not impaired. But back to the games themselves.

*Martian Raider* is a 'skim along the surface of a planet firing and dropping bombs as you go' type which I find exceedingly difficult to play, but which is a hot favourite with my children. In fact my eight-year-old son is extremely proficient at this version and explained some features of the game which had been omitted from the instructions but which dedicated players would probably pick up without thinking. For example, a purple line representing time running out gradually moves along the top of the screen as you play. Once it has run out of space, you lose a life — which I doubt I would have spotted myself in view of the fact I was too busy trying to avoid hitting the ground with my ship.

*Sea Invasion* is really space invaders with crabs, starfish and octopi — instead of various aliens — descending on you firing with manic ferocity as you guide your 'ship' from side to side firing as you go. It is extremely fast (you feel physically exhausted at the end) and harder than Commodore's *Avenger*.

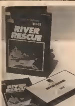
The last Romik game was *Shark Attack*, refreshingly different to me in that the idea is to trap sharks inside a net which you draw on the screen and 'trail' behind you. The sharks are easily trapped, but then eat their way out of the net. If they get to you there is an explosion and you lose a life. On the assumption you survive the sharks and cover the entire screen with your net, then some attractively-drawn green octopi appear to menace you as well.

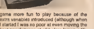
Romik Software costs £9.99 a cassette. It has a slightly more original approach than Bug-Byte (especially *Shark Attack*) and is much faster. Instructions for the games are well-presented and each cassette contains a version on both sides to allow for loading errors — a feature I was grateful for as I did experience quite a few. On the whole £9.99 still seems expensive when compared with the cost of the cartridges available which do offer much better graphics and speed, but compared with much of the material around I feel Romik to be good value.

Speaking of cartridges, let's look at a new entry into the Vic field: Thorn EMI. Their first catalogue features a host of various offerings, mainly for the Atari, including Soccer games, Jigsaw Puzzles, Nursery Rhymes, Darts and Dominoes — it looks very promising for the Vic Owner in the future.

The Vic cartridge I had for review was *River Rescue*, packed in a video cassette pack which contained a separate instruction booklet (hooray!) and which is really just another version of Road Race. You are in control of a ship which you can steer along a river at various speeds, dodging or firing upon the hazards along the way. To add interest to this game though, Thorn has added the factor that you occasionally come across a dock where you stop the boat to try and pick up an 'explorer' and add him to your crew. If you can pick up three men and then dock all three safely you are awarded bonus points.

The game is not only very difficult to play, but as your skill increases so a higher level appears in that the river changes colour and the hazards become more difficult. Also the faster you move the boat the more points you achieve. I found this





game more fun to play because of the extra variables introduced (although when I started I was so poor at even moving the boat any distance at all before losing a life that I almost gave up). At £24.95* it is good value.

The final game in this review is *Subspace Striker* distributed by Pixel Productions. Interestingly, this game is vastly superior graphically to the others I have reviewed, yet the advertisements in the computer journals are much less appealing. Is there some form of subtlety there? I doubt it myself, but it *is* interesting.

*Subspace Striker* requires 16K expansion, unlike all the other cassette-based programs so far, and is not really in the same category. Speed is less important, whereas interest and versatility are.

The essence of the game is that you are at the controls of a spaceship which is capable of jumping out of hyperspace to fire torpedoes at enemy spaceships and then slipping back into hyperspace when the enemy tries to fire back at you. Most of the time the screen displays a view as if you were looking out of the window of your spaceship, or at your firing screen, but occasionally you see the spaceship fading in and out of hyperspace in a dramatic Star Trek fashion.

The graphics in this game really are superb, whether it is the picture of a passing Altair class cruiser or an Orion sweeper attacking you head on. As you appear out of hyperspace you get the chance to fire at the enemy ship as it blips across your radar screen, but you may also be fired upon and have to dive back into hyperspace before being hit. A most enjoyable variation is that the enemy can drop mines into hyperspace to follow and destroy you, and you have to sit watching the screen and waiting as the mines drop around your ship before exploding. If they are too close — that's it! This aspect really adds suspense, a feature usually lacking from this type of game.

The price of this game is £9.50 which I feel to be excellent value, partly because of the graphics, but mainly because the game adds a slight element of skill, a large element of interest and a terrific element of fun. *Star Wars* fans can imagine they are sitting in the Millennium Falcon along with Luke and Han firing the buttons — a hit rewards you with a multicoloured display of debris and wreckage in true sf style. The first time I made a kill we all cheered just like they did in the cinema.

Pixel also provide a few words of help in the nicely-typed leaflet which accompanies the game. As you can tell, this is my favourite of the games I've reviewed, and also my favourite of the games I've ever played in this category.

A couple of general points. All the games, with the exception of *Subspace Striker*, can be played with a joystick, but of course will also work on keys. Romik scores here in that an attempt has been made to standardise various keys to various functions throughout their range of games, but I find that manipulating five keys as in *Martian Raider* is just too much for me. Nonetheless, if you do not have a joystick it must be better to know which keys do which operation, as watching keyboard and screen simultaneously is virtually impossible. The other point is that all the games run on the unexpanded Vic (again with the exception of Pixel's *Subspace Striker*). It is good to see what are essentially good graphics and in Romik's case basically good speed in the limited memory available.

I have just dipped into a few of these games to get a taste of the market, covering a fair range of what is available. The essence of the arcade-style game must remain the speed and skill of shooting down or dodging the enemy. While it is addictive at times, I also feel it is often not satisfying for long. As such, games like *River Rescue*, with increasing levels and versatility, or *Subspace Striker*, with its different approach and excellent graphics, must come out on top.

For younger children the alternatives provide just that — an alternative — but often the price seems too high or the game too slow or with too many faults. But as with all reviews, do remember this is my own opinion.

My best advice is to try and see the game before buying, either at an exhibition or a computer shop. And do remember — the aim of this type of game remains that it should be fun.

| Firm | Program | Cassette or Cartridge | Cost | Value (1-10) |
| --- | --- | --- | --- | --- |
| Bug Byte<br>100 The Albany<br>Old Hall Street<br>Liverpool L3 9EP | *Vic Asteroids*<br>*Cosmiade* | Cassette<br>Cassette | £7.00<br>£7.00 | 3<br>5 |
| Pixel<br>39 Ripley Gardens<br>London SW14 8HF | *Subspace Striker* | Cassette (16K) | £9.50 | 9 |
| Romik<br>24 Church Street<br>Slough SL1 1PT | *Martian Raider*<br>*Sea Invasion*<br>*Shark Attack* | Cassette<br>Cassette<br>Cassette | £9.99<br>£9.99<br>£9.99 | 6<br>5<br>7 |
| Thorn EMI<br>Thorn House<br>Upper St Martins Lane<br>London WC2 | *River Rescue* | Cartridge | £24.95* | 8 |

*Prices can vary depending on the retailer


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## Parachutist

### on Spectrum

The first thing to do on running this program is to load the user-defined characters. Type in and run lines 10-30 first.

User-defined characters are used in lines

90 B + B + C − A
190 D + E
191 F + G
192 A
129 SPC + H + I + I + J + SPC
149 L
179 K − L

```
   1 REM PARACHUTIST
        © ANDREW ASTRAND
   5 LET sc=0: LET j=11
   9 GO TO 40
  10 RESTORE : FOR y=144 TO 155
 LET a$=CHR$ y: FOR x=0 TO 7: RE
AD a: POKE USR a$+x,a: NEXT x: N
EXT y
  20 DATA 24,24,24,24,24,24,24,2
4,1,3,7,15,31,63,127,255,128,192
,224,240,248,252,254,255,31,16,0
1,16,16,21,16,31,224,32,32,32,32
,32,32,224,7,4,4,4,4,4,4,7,0,0,0
,160,0,0,160,0,160
  30 DATA 240,240,252,254,255,0
0,255,255,0,0,0,0,255,170,128,0
0,0,0,0,0,248,160,80,255,80,120,
255,255,255,255,231,126,163,90,6
0,24,24,36,66,126
  40 PRINT AT 0,0;"Do you need i
nstructions (y/n) ?": BEEP 0.1,0
  IF INKEY$="" THEN GO TO 40
  50 IF INKEY$="y" THEN GO TO 10
00
  60 IF INKEY$="n" THEN GO TO 80
  70 GO TO 40
  80 BORDER 0: PAPER 0: CLS
  85 LET j=j-1: IF j<0 THEN GO
TO 900
  90 LET a=INT (RND*3): LET b=IN
T (RND*20+8): INK 6: PRINT AT 21
,b;"▲";AT 20,b+1;"|": GO TO a+
100
 100 PRINT AT 19,b+1;"▛": LET a
=5: GO TO 110
 101 PRINT AT 19,b;"▛": LET a=-
.5: GO TO 110
 102 PRINT AT 19,b+1;"|": LET a=
0: GO TO 110
 110 INK 7: PRINT AT 20,0;"SCORE
=";sc;AT 21,0;"JUMPS=";j
 120 FOR z=0 TO 26: PRINT AT 0,z
;" ▙": BEEP 0.08,-10: BEEP 0.
02,10: IF INKEY$="j" THEN GO TO
140
 130 PAUSE 5: NEXT z: PRINT AT 0
,z;" ": GO TO 120
 140 FOR c=1 TO 10: BEEP 0.1,30-
c: INK 6: PRINT AT c,z;" ";AT c+
1,z;"X": PAUSE 6
 150 IF INKEY$="p" THEN GO TO 17
0
 160 PRINT AT c,z;" ";AT c+1,z;
" ": NEXT c: PRINT AT c,z;"SPLAT!
": FOR x=0 TO -20 STEP -1: BEEP
0.02,x: NEXT x: GO TO 800
 170 FOR d=c TO 19: BEEP 0.1,30-
d: PRINT AT d,z;"▲";AT d+1,z;"X"
: PAUSE 10: PRINT AT d,z;" ";AT
d+1,z;" ": LET z=z+a: IF z>31 TH
EN LET z=0
 171 NEXT d
 180 IF z=b+1 THEN LET sc=sc+20:
 BEEP 0.5,20: GO TO 80
 190 IF z=b OR z=b+2 THEN LET sc
=sc+10: BEEP 0.5,10: GO TO 80
 200 LET sc=sc+1: BEEP 0.5,1: GO
TO 80
 800 PRINT AT 0,0;"You waited to
long to pull the ripcord so yo
u think you are a bird. your sc
ore was ";sc;" and you had ";j;"
jumps left"
 810 PRINT AT 10,0;"Do you want
another go (y/n) ?": IF INKEY$=
"y" THEN RUN
 820 IF INKEY$="n" THEN STOP
 830 GO TO 810
 900 PRINT AT 0,0;"Out of your a
llotted ten jumps. you scored "
;sc;" points"
 910 PRINT AT 10,0;"Do you want
another go (y/n) ?": IF INKEY$=
"y" THEN RUN
 920 IF INKEY$="n" THEN STOP
 930 GO TO 910
1000 CLS : PRINT AT 0,10;"PARACH
UTIST": PRINT AT 0,10; OVER 1;"_
_________": PRINT "j-Jump from
the plane"
1010 PRINT "p-Pull the parachute
 ripcord": PRINT : PRINT "The sc
oring is as follows": PRINT "20
Points for a direct hit on": PRI
NT "the flag"
1020 PRINT "10-Points for a hit
slightly at": PRINT "the sides"
: PRINT "1-Point for a safe landi
ng": PRINT : PRINT "BEWARE you d
o not travel in a": PRINT "strai
ght line. the wind": PRINT "dire
ction is shown by the way"
1030 PRINT "the flag is pointing"
: PRINT : PRINT "Press any key
to start": PAUSE 300: PAUSE 0: G
O TO 80
```

```
SCORE=0
JUMPS=10

PARACHUTIST
© ANDREW ASTRAND
28/10/1982
```

run time ten before running the whole program

**Parachutist**
*by Andrew Astrand*

## Puckman

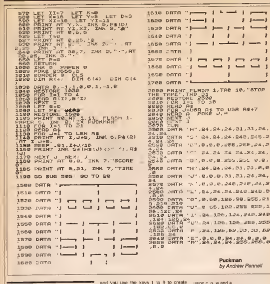
### on Spectrum

This is a version of Puckman with a 'Power pill' facility that gives bonus points for a quick time in clearing the screen. Please note that the characters in lines 72, 260, 455, 460, 470, 475, 490 and 610 are graphics Qs, and in lines 240, 530, 630 and 640 are graphics Es.

## PROGRAM OF THE WEEK

```
   1 REM [redacted]
   2 REM (c) A M Pennel
  10 GO TO 400
  20 LET D=IN (P): BORDER 7/3
 LET A$=INKEY$
  22 LET T=T+1: PRINT AT 0,26; I
NK 7;T
  30 IF A$<"" THEN LET D=(A$="7
")*2+(A$="6")*4+(A$="5")+(A$=
"8")
  40 IF D=0 THEN GO TO 130
  50 LET A=ATTR (Y+B(D),X+A(D))
  60 IF A=4 THEN GO TO 130
  65 IF A=7 OR A=3 THEN LET S=S+
10: LET K=K+1: BEEP .007,9: PRIN
T AT 0,6; INK 7;S
  70 IF K=134 THEN PRINT AT Y+B(
D),X+A(D); INK 6;P$(D);AT Y,X; I
NK 6;" ": GO SUB 500: GO TO 60
  72 IF A=3 THEN LET P=20: PRINT
 AT Y1,X1; INK 2; FLASH 1;"■"
  75 PRINT AT Y,X; INK 6;" "
  80 LET X=X+A(D): LET Y=Y+B(D)
  85 IF X=0 AND Y=12 AND D=4 THE
N LET X=26
  90 IF X=27 AND Y=11 AND D=2 TH
EN LET X=5
 100 PRINT AT Y,X; INK 6;P$(D)
 102 IF P=0 THEN GO TO 300
 104 IF P=1 THEN GO TO 400
 110 LET YY=Y-YI: LET XX=X-XI: I
F P THEN LET XX=-XX: LET YY=-YY
 111 IF D<>0 AND P=0 THEN LET YY
=YY+B(D): LET XX=XX+A(D)
 113 BEEP .007,-20
 115 IF ABS YY>ABS XX THEN GO TO
160
 120 LET B=2+2*(XX<0)
 130 LET C=1+2*(YY>0)
 140 GO TO 170
 150 LET B=1+2*(YY>0)
 160 LET C=2+2*(XX<0)
 170 FOR I=1 TO 4
 175 LET A=ATTR (YI+B(I),XI+A(I)
)
 180 IF A=5 AND P=0 THEN LET M=I
: GO TO 260
 182 IF A=6 AND P THEN GO TO 90
 185 LET C(I)=(A=5)
 190 NEXT I
 200 IF C(B)=0 THEN LET M=B: GO
TO 240
 210 IF C(C)=0 THEN LET M=C: GO
TO 240
 220 IF C(B+2-4*(B>2))=0 THEN LE
T M=B+2-4*(B>2): GO TO 240
 230 IF C(C+2-4*(C>2))=0 THEN LE
T M=C+2-4*(C>2): GO TO 240
 235 GO TO 20
 240 PRINT AT YI,XI; INK 7*(II=7
)+3*(II=3)
 245 IF P THEN BEEP .007,-5
 250 LET XI=XI+A(M): LET YI=YI+B
(M)
 255 LET II=ATTR (YI,XI): IF II=
6 AND P=0 THEN GO TO 300
 257 IF II=6 AND P THEN GO TO 40
0
 260 PRINT AT YI,XI; INK 2; FLAS
H (P<>0);"■"
 270 GO TO 20
 300 FOR I=1 TO 4
 310 PRINT AT Y,X; INK 6;P$(I)
 320 BEEP .1,I*I-20
 330 NEXT I: PRINT AT Y,X;" "
 340 LET Y=Y-1
 350 IF Y>0 THEN GO TO 300
 360 BEEP 2,-5
 370 STOP
 400 LET P=0
 410 BORDER 7: LET S=S+100+10*(I
I=7)
 415 IF II=7 THEN LET K=K+1
 420 PRINT AT 0,6;S
 430 BEEP 1,-5
 440 BORDER 0
 445 IF XI=15 THEN GO TO 465
 450 FOR I=XI TO 15 STEP SGN (15
-XI)
 455 LET A=ATTR (YI,I): PRINT AT
 YI,I; INK 2; OVER 1;"■"
 460 BEEP .1,I: PRINT AT YI,I; I
NK A; OVER 1;"■": NEXT I
 465 IF YI=11 THEN GO TO 480
 467 FOR I=YI TO 11 STEP SGN (11
-YI)
 470 LET A=ATTR (I,15): PRINT AT
 I,15; OVER 1; INK 2;"■"
 475 BEEP .1,I: PRINT AT I,15; I
NK A; OVER 1;"■": NEXT I
 480 LET XI=15: LET YI=11
 485 LET II=ATTR (YI,XI)
 490 PRINT AT YI,XI; INK 2;"■"
 495 GO TO 20
 500 PRINT AT 0,26; INK 2; FLASH
 1;T
 502 LET S=S+50: IF T>500 THEN G
O TO 504
 503 LET S=S+(500-T)
 504 PRINT AT 0,6; FLASH 1; INK
2;S
 505 FOR N=0 TO 20
 510 FOR M=5 TO 25
 530 IF ATTR (N,M)<>4 THEN PRINT
 AT N,M; INK 7;".": BEEP .005,10
+N+M-21
 540 NEXT M
 550 NEXT N
 560 PRINT AT 11,0; INK 0;"  ";A
T 11,29; INK 0;
```

Continued on page 17



```
570 LET II=7  LET K=0
580 LET X=16  LET Y=5  LET D=3
590 LET XI=16  LET YI=11
600 PRINT AT Y,X, INK 6,P$(D)
610 PRINT AT YI,XI, INK 2,"♠"
620 PRINT AT 0,6,S
625 LET T=0
627 PRINT AT 0,25,"0
630 PRINT AT 2,7, INK 3,"·",AT
2,25, INK 3,"·"
640 PRINT AT 20,7, INK 3,"·",AT
20,25, INK 3,"·"
650 LET P=0
660 RETURN
1000 INK 6  PAPER 0
1005 POKE 23656,8
1010 BORDER 0  CLS
1020 DIM A(4)  DIM B(4)  DIM C(4
)
1030 DATA 0,-1,1,0,0,1,-1,0
1040 RESTORE 1030
1050 FOR I=1 TO 4
1060 READ A(I),B(I)
1070 NEXT I
1080 LET S=0
1090 LET P$=
1100 RESTORE 1500
1105 PRINT #0 AT 1,11  FLASH 1.
PAPER 6. INK 2,"ZX PUCKMAN
1110 FOR I=1 TO 21
1120 READ A$
1130 FOR J=1 TO LEN A$
1140 PRINT AT I,J+5, INK 6,P$(2)
,AT I,J+5,
1150 BEEP .01,I+J/16
1160 PRINT INK 5*(A$(J)<>" "),A$
(J)
1170 NEXT J  NEXT I
1180 PRINT AT 0,0, INK 7,"SCORE
0"
1185 PRINT AT 0,21, INK 7,"TIME
0"
1190 GO SUB 505  GO TO 20
1500 DATA "
1510 DATA "
1520 DATA "
1530 DATA "
1540 DATA "
1550 DATA "
1560 DATA "
1570 DATA "
1580 DATA "
1590 DATA "
1600 DATA
1610 DATA "
1620 DATA "
1630 DATA "
1640 DATA "
1650 DATA "
1660 DATA
1670 DATA "
1680 DATA "
1690 DATA "
1700 DATA "
2000 PRINT FLASH 1,TAB 10,"STOP
THE TAPE",TAB 31
2005 RESTORE 2500
2010 FOR I=1 TO 16
2020 READ A$
2030 FOR J=USR A$ TO USR A$+7
2040 READ A  POKE J,A
2050 NEXT J
2060 NEXT I
2070 RUN
2500 DATA "H",24,24,24,31,31,24,
24,24
2510 DATA "G",24,24,24,248,248,2
4,24,24
2520 DATA "D",0,0,0,255,255,24,2
4,24
2530 DATA "C",24,24,24,24,24,24,
24,24
2540 DATA "B",0,0,0,255,255,0,0,
0
2550 DATA "H",24,24,24,31,31,0,0
,0
2560 DATA "J",0,0,0,31,31,24,24,
24
2570 DATA "K",0,0,0,248,248,24,2
4,24
2580 DATA "L",24,24,24,248,248,0
,0,0
2590 DATA "O",0,60,126,90,255,21
9,219,219
2600 DATA "U",0,66,102,255,255,1
26,126,24
2610 DATA "I",24,126,124,248,248
,124,126,24
2620 DATA "U",24,126,126,255,255
,102,66,0
2630 DATA "P",24,126,62,31,31,62
,126,24
2640 DATA "E",0,0,0,24,24,0,0,0
2650 DATA "M",24,24,24,255,255,0
,0,0
```

**Puckman**
*by Andrew Pennell*

## Music trainer

on Vic-20

This program is designed to show the musical scale and what notes come where. The program draws the five bars and you use the keys 1 to 9 to create music like an organ

As you play the notes appear on the bars and when they come to the end the bars are scrolled up the screen and more drawn. The three voices can be selected using c, q, w and e

**Program notes:**

100 to 123 Input the notes and voice
124 to 180 Draw the note and play it.
500 to 540 Draw the bars
600 to 660 Initialise the variables
700 to 780 Print the instructions

```
1 REM ********************
2 REM * ALAN BLACKHAM'S *
3 REM *   MUSIC TRAINER *
4 REM *     (26/10/82)  *
5 REM ********************
7 GOSUB 700
10 POKE36879,8
12 SCNCLR
15 POKE 36870,15
20 GOSUB 600
25 GOSUB 500
100 REM ** INPUT NOTES **
101 N=N+1 M=M+1
102 IFM>21THEN GOSUB 500 M=1
110 GETA$
111 IF A$="P"THEN END
112 IFA$="Q"THEN S=36874
    GOTO 110
113 IFA$="W"THEN S=36875
    GOTO 110
114 IFA$="E"THEN S=36876
    GOTO 110
120 B=VAL(A$) IFB=0THEN 110
122 IFB>9THEN 110
123 IF B=9THENM=0 GOTO 25
124 POKE N,B(B)
125 POKEN-(B*22),81
130 POKE S,A(B)
140 IFPEEK(197)<>64THEN 140
```

Turn to page 18

```
150 POKES,0
160 GOTO 100
500 REM ** DRAW BARS **
510 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
520 FORI=1TO5
530 PRINT"|-----------------------------|" NEXT 1
535 PRINT"▒▒▒▒"'N=8076
540 RETURN
600 REM ** INITIALISE VARIABLES **
610 FORI=1TO8
620 READ A(I),B(I)
630 NEXT I S=36875
640 RETURN
650 REM ** DATA FOR NOTES **
660 DATA 223,3,227,4,230,5,231,6,234,7,
    236,1,238,2,239,3
700 REM ** INSTRUCTIONS **
720 PRINT"▒#     MUSIC TRAINER"
725 PRINT"     ____________________"
730 PRINT PRINT"▒USE THE KEYS 1 TO 8
    TO CREATE THE NOTES."
740 PRINT"▒▒THERE ARE THREE TONES THAT
    ARE CHOSEN WITH "
742 PRINT"▒  Q=HIGH
744 PRINT"  W=MEDIUM
746 PRINT"  E=LOW
750 PRINT"▒▒TO CLEAR SCREEN PRESS THE
    KEY 9."
755 PRINT"▒USE 'P' TO END THE    PROGRAM."
760 PRINT"▒▒▒PRESS SPACE TO START▒"
770 GETA$ IFA$<>" "THEN 770
780 RETURN

READY.
```

**Music Trainer**
*by Alan Blackham*

## Card addition

on BBC Micro

This was designed to help my young children recognise groups and to assist them to add up in a fun way. The program is properly structured and has been thoroughly tested on a BBC Model B. The program uses colour and high resolution graphics as well as user-defined characters. Instructions are given in the program.

```
10 MODE 7
20 PRINT
30 PRINTTAB(11,9)CHR$141+"CARD ADDITION"
40 PRINTTAB(11,10)CHR$141+"CARD ADDITION"
50 PRINTTAB(5,15)"(c) M.O Alger 1982"
60 PRINTTAB(7,22)CHR$136"PRESS SPACE BAR
   TO START":REPEATUNTILGET=32
70 SEED=RND(-TIME)
80 DIM played(4,13),AX%(13),AY%(13)
90 newtime=0:oldtime=1000:COUNTER=0
100 ans$="":flag=0:total=0:right=0:wrong=0
110 PROCinstructions
120 CLS
130 PRINTTAB(0,12)"Please type your age
    (years only)";
140 INPUT age
150 IF age>99 OR age<1 THEN 120
160 MODE 1
170 PROCdefine
180 target_time=INT(200/age)
190 IF target_time<8 THEN target_time=8
200 REPEAT
210 CLS
220 total=0
230 COUNTER=COUNTER+1
240 COLOUR 131
250 FOR X%=0 TO 39 STEP 8:SOUND1,
    -15,RND(200),1
260 PROCdrawcard(X%)
270 total=total+CARD%
280 NEXT
290 COLOUR 128:COLOUR2
300 PRINTTAB(0,15)"Please type your
    answer and then RETURN "
310 TIME=0
320 PRINTTAB(0,19)"Target time ";
    target_time" secs"
330 A$=""
340 REPEAT
350 A$=INKEY$(0)
360 IF TIME>target_time*100 THEN
    PROCtimeup:A$=CHR$13
370 PRINTTAB(12,22)"TIME=";INT(TIME/
    100);" SECS"
380 IF A$=CHR$13 THEN flag=1:GOTO420
390 IF ASC(A$)<48 OR ASC(A$)>57 THEN 350
400 IF A$<>"" THEN SOUND 2,-15,200,1
410 ans$=ans$+A$
420 PRINTTAB(10,17)ans$
430 UNTIL flag=1
440 IF ans$<>"" THEN addition=EVAL(ans$)
    ELSE addition=0
450 IF addition=total THEN PROCright ELSE
    PROCwrong
460 ans$="":flag=0
470 UNTIL COUNTER>4
480 MODE 7
490  PRINTTAB(3,11)CHR$141+CHR$129;"You
    scored ";right;CHR$141+CHR$129+"
    correct answers"
500 PRINTTAB(3,12)CHR$141+CHR$129;"You
    scored ";right;CHR$141+CHR$129+"
    correct answers"
```

```
510 IF right=5 PROCsong ELSE PROCburp
520 END
530 ********************************
540 DEF PROCsong
550 RESTORE 600
560 VDU 31,0,24
570 FOR Q=1TO11:READP,D
580 IFP=999 L=0 ELSE L=-15
590 SOUND 1,L,P,D:SOUND1,0,0,3:NEXT
600 DATA 97,15,97,5,101,5,101,5,999,5,97,
    5,101,10,97,2,89,5,81,5,77,10
610 ENDPROC
620 ********************************
630 DEF PROCdrawcard(X%)
640  REM X%= STEPS OF 8
650 FOR T%=1 TO 11
660 PRINT TAB(X%,T%);STRING$(7," ")
670 NEXT
680 PROCselectcard
690 RESTORE 760
700 READ MANY,No,value$
710 FOR I=1 TO MANY
720 READ AX%(I),AY%(I)
730 NEXT I
740 IF No=CARD% PROCpictureon ELSE 700
750 RESTORE 760
760 DATA 1,1,"A",3,6
770 DATA 2,2,"2",3,3,3,9
780 DATA 3,3,"3",3,3,3,6,3,9
790 DATA 4,4,"4",1,3,5,3,1,9,5,9
800 DATA 5,5,"5",1,3,5,3,3,6,1,9,5,9
810 DATA 6,6,"6",1,3,5,3,1,6,5,6,1,9,5,9
820 DATA 7,7,"7",1,3,5,3,3,4,1,6,5,6,1,9,
    5,9
830 DATA 8,8,"8",1,3,5,3,3,4,1,6,5,6,3,8,
    1,9,5,9
840 DATA 9,9,"9",1,3,5,3,1,5,5,5,3,6,1,7,
    5,7,1,9,5,9
850 DATA 10,10,"10",1,3,5,3,3,4,1,5,5,5,1
    ,7,5,7,3,8,1,9,5,9
860 ENDPROC
870 ********************************
880 DEF PROCdefine
890 VDU23,224,8,28,28,107,127,107,8,28
900 VDU23,225,8,28,62,127,62,28,8,0
910 VDU23,226,54,127,127,127,62,28,8,0
920 VDU23,227,8,28,62,127,127,127,28,62
930 VDU23;8202;0;0;0;
940 fill$=CHR$220
950 ENDPROC
960 ********************************
970 DEF PROCselectcard
980 REPEAT
990 SUITE%=RND(4)
1000 CARD%=RND(10)
1010 UNTIL played(SUITE%,CARD%)=0
1020 played(SUITE%,CARD%)=1
1030 SUITE$=CHR$(223+SUITE%)
1040 ENDPROC
1050 ********************************
1060 DEF PROCpictureon
1070 IF SUITE$=CHR$224 OR SUITE$=CHR$227
     THEN COLOUR 0 ELSE COLOUR 1
1080 FOR I=1 TO MANY
1090 PRINT TAB(X%+AX%(I),AY%(I)),SUITE$
1100 NEXT
1110 ENDPROC
1120 ********************************
1130 DEF PROCinstructions
1140 CLS
1150PRINTTAB(0,5)"Five different playing
     cards will"
1160 PRINT
1170PRINT"be drawn on the screen. You have
     to"
1180 PRINT
1190PRINT"add up the spots and type in the
     answer"
1200 PRINT
1210PRINT"then press return."
1220 PRINT
1230PRINT"You must try to beat the target
     time"
1240 PRINT
1250 PRINT"An ACE counts one point."
1260 PRINT
1270PRINT"You will get five tries."
1280 PRINTTAB(5,23)CHR$136"PRESS SPACEBAR
     TO CONTINUE"
1290 REPEAT UNTIL GET=32
1300ENDPROC
1310 ********************************
1320 DEF PROCtimeup
1330 SOUND 0,-15,50,20
1340 FOR T=1 TO 3000:NEXT
1350 flag=1
1360 *FX 15,1
1370 ENDPROC
1380 ********************************
1390 DEF PROCright
1400 right=right+1
1410 ENDPROC
1420 DEF PROCwrong
1430 wrong=wrong+1
1440 ENDPROC
1450 ********************************
1460 DEF PROCburp
1470 FOR X=1 TO 20
1480 SOUND 1,-15,RND(5),2
1490 NEXT
1500 ENDPROC
```

**Card addition**
*by Mike Alger*

## Copy-colour

### on Dragon

Copy-colour tests your memory recall of a sequence of colours and sounds. At the beginning of the game the computer asks for the maximum length of the sequence to be attempted. The colours used are Red, Yellow, Blue and Green. The player memorises the sequence and types it back in using the first letter of each colour. It is not necessary to press enter after each separate entry. After each correct entry the sequence increases by one colour. If an incorrect guess is made the game ends.

```
10 REM COPY-COLOUR
20 INPUT"MAXIMUM LENGTH OF YOUR SE
   QUENCE";K
30 NC=1:DIM A(K)
40 A(NC)=RND(4)
50 FOR F=1 TO NC
60 CLS A(F):SOUND A(F)*50,5
70 CLS0
80 NEXT F
90 CLS0
100 FOR F=1 TO NC
110 Z$=INKEY$:IF Z$="" THEN 110
120 IF Z$="R" THEN GU=4
130 IF Z$="B" THEN GU=3
140 IF Z$="Y" THEN GU=2
150 IF Z$="G" THEN GU=1
160 CLSGU
170 SOUND GU*50,5
180 IF GU<>A(F) THEN 300
190 CLS0
200 Z$=""
210 NEXT F
220 CLS0
230 FOR F=1 TO 300:NEXT F
240 NC=NC+1:IF NC<>K+1 THEN 40
250 PRINT"WELL DONE YOU MANAGED ALL
   ";K;"   COLOURS"
260 INPUT"AGAIN(Y OR N)";U$
270 CLS0
280 IF U$="Y" THEN RUN
290 STOP
300 PRINT"HARD LUCK YOU ONLY MANAGED
   ";NC-1;"   COLOURS":GOTO 260
```

*by Stephen Nicholls*

## Colour-display

### on Dragon

This program, simple as it is, sets up an ever changing display of coloured squares on the screen. It is an ideal starting point for experimenting with perpetual generation programs.

As written, the display starts with a black screen. Try changing line 10 to: 10 CLS 3

This not only changes the screen colour, it also cuts out any black from the display. Now add line 59 RESET(P,K) and the display will be more attractive, but will begin to deteriorate until you are left with just a multi coloured square with a flashing point of colour.

Finally add lines 55 S = (RND(255)) and 58 SOUND S,1 and you have Dragon's version of "INDOOR FIREWORKS".

```
10 CLS0
20 P=(RND(62))
30 K=(RND(30))
40 L=(RND(7))
50 SET(P,K,L)
60 GOTO 20
```

Program notes

| | |
|---|---|
| 10 | Sets screen colour |
| 20 to 30 | Set random position on screen |
| 40 | Sets random colour |
| 50 | Prints coloured point |
| 60 | Creates loop |

*by David Windle*

## Shootout

### on Spectrum

The object of the game is to shoot as many cowboys as possible on the left of the screen with your figure before the opposite cowboy homes in and shoots you.

When run, your figure will appear on the far right of the screen, coloured black. The computer's figure starts at a random position on the far left, coloured red. Each cowboy can only move up and down, and your cowboy is limited to four shots.

To move down press "6" and up "7". To fire press "0". You score one point per cowboy and you have only one life.

Replace the capital As in lines, 105, 2002, 9001 with a graphic "A". Replace the capital Cs in lines 104, 1002, 2002, 9001 with a graphic "C". Replace the capital B in line 85 with a graphic "B". These characters will be replaced by cowboys and a cactus when you run the program.

The program contains instructions and the score is constantly displayed along with the number of shots left on the screen.

```
   1 REM PRESS CAPS LOCK BEFORE
RUNNING
   2 INPUT INK 2, INSTRUCTIONS (Y
 OR N)",y$
   3 IF y$="Y" THEN GO SUB 7000
   4 RANDOMIZE
  10 DATA BIN 00011000,BIN 01111
100,BIN 00110000,BIN 00010000,BI
N 11110000,BIN 00110000,BIN 0000
0000,BIN 00110000
  11 DATA BIN 00000000,BIN 00010
100,BIN 01010100,BIN 01111100,BI
N 00010000,BIN 00010000,BIN 0001
0000,BIN 00000000
  12 DATA BIN 00011000,BIN 00111
110,BIN 00001100,BIN 00001000,BI
N 00001111,BIN 00001100,BIN 0000
1000,BIN 00001100
  15 FOR n=144 TO 146
  17 LET a$=CHR$ n
  20 FOR x=0 TO 7
  22 READ a
  25 POKE USR a$+x,a: NEXT x
  30 NEXT n
  37 LET SC=0
  40 LET c=15: LET c1=31
  50 LET i=INT (RND*20)+1: LET i
1=0
  60 LET b1=0
  62 LET ar4=0: LET b14=0
  64 BORDER 6
  66 PAPER 6: CLS
  70 FOR x=1 TO 15
  80 LET ca=INT (RND*28)+5: LET
ca1=INT (RND*21)+1
  85 PRINT AT ca1,ca; INK 4;"B"
 NEXT x
  90 PRINT AT 21,5; INK 2; PAPER
 6;"SCORE=";AT 21,17; INK 2; PA
PER 6;"SHOTS=4"
  99 LET sh=4
 100 REM indian think
 101 LET ar1=182-(i*8)-28: LET a
r2=1*8: LET b11=c1*8: LET b12=1
81-(c*8)-28
 102 BEEP 0.1,-5
 103 LET id=i: LET i1d=i1: LET c
d=c: LET c1d=c1
 104 PRINT AT i,i1d; INK 2;"C"
 105 PRINT AT c,31; INK 1;"A"
 106 BEEP 0.00,-30
 107 INK 2: PAPER 6: PRINT AT 21
,11;SC;AT 21,23;SH
 108 INK 0: LET AA=INT (RND*100)
+1: IF AA<35 THEN GO SUB 1000
 109 IF AA<10 THEN GO SUB 1000
 110 IF i>c AND RND>.5 THEN LET
i=i-1
 115 IF i<c AND RND<.5 THEN LET
i=i+1
 120 IF C<1 THEN LET c=0: IF i>1
THEN LET i=0
 155 IF i<0 THEN LET i=0: IF i>1
9 THEN LET i=19
 160 REM player think
 161 IF INKEY$="6" THEN LET c=c+
1
 162 IF INKEY$="7" THEN LET c=c-
1
 170 IF c>19 THEN LET c=19: IF c
<0 THEN LET c=0
 231 IF INKEY$="0" THEN GO SUB 2
000
 232 REM print cowboy
 240 IF INKEY$="0" THEN GO SUB 2
000
 245 PRINT AT cd,c1d; PAPER 6;"
";AT id,i1d; PAPER 6;" "
 250 GO TO 100
1000 PRINT AT i-1,0;" ";AT i+1,0
;" ";AT i,0; INK 2;"C": BEEP 0.0
3,-10
1001 PLOT ar1,ar2: DRAW INK 2,24
0,0: PLOT ar1,ar2: DRAW OVER 1,2
40,0
1002 PRINT AT i,0; INK 2;"C"
1010 IF i=c THEN GO TO 9000
1020 RETURN
2000 IF sh=0 THEN RETURN
2001 BEEP 0.00990999,-10: PLOT b
11,b12: DRAW INK 0,-240,0: PL
b11,b12: DRAW OVER 1,-240,0
2002 PRINT AT i,0; INK 2;"C";AT
c,31; INK 0;"A"
```

```
2010 IF c=1 THEN GO SUB 8000
2020 LET ch=ch-1  RETURN
7000 CLS
7010 PRINT TAB 11, INK 2,"SHOOTO
UT"  PRINT   PRINT
7020 PRINT  "You are centreling t
he cowboy
7030 PRINT  "On the right of the
screen.The
7040 PRINT  "Computer controls th
e cowboy on
7050 PRINT "The left"
7060 PRINT  "The object is to sho
ot the other"
7070 PRINT  "Cowboy before he sho
ots YOU !!"
7080 PRINT  "BUT BEWARE !! you ha
ve only 4    Shots
7090 PRINT  "And the cacti offer
no cover"
7100 PRINT  "The controlls are "
6  -DOWN
7110 PRINT    "7" -UP and "0" -FI
RE
7120 PRINT   PRINT   PRINT   PRI
NT "PRESS ANY KEY TO START"  PAU
SE 4E4
7900 RETURN
8000 FOR X=0 TO 20  PRINT AT Y,X
, INK 0,"  NEXT X  BEEP 2,25
LET SC=SC+1  LET I=INT (RND*21)
 GO TO 95
9000 FOR X=0 TO 20  PRINT AT X,0
, INK 6,"",AT X,31, INK 5 ""
9001 PRINT AT 1,0, INK 2,"C"  PR
INT AT c,31, INK 0,"A"
9002 FOR Y=20 TO 30  BEEP 0.2 Y
 NEXT Y
9997 PRINT AT 0,11, INK 2,"SHOOT
OUT"   PRINT   PRINT   PRINT TAB
10, INK 2,"GAME OVER"
9995 PRINT   INPUT "Another game
 (Y or N)",y$  IF y$="Y" THEN RU
N
9999 NEW
```

**Shootout**
*by Adnan Gelsthorpe*

## Scramble

on Vic 20

This game uses no sound and only one colour but for its size is both addictive and difficult. The program was written as a test routine for a machine code scroll right routine. This routine lines 120 to 150, scrolls a portion of the screen right. Since the colour array is not scrolled, the use of colours is not really feasible. By altering portions of the code any window in the screen can be scrolled.

The eighth and twelfth bytes in line 120 (current values 220 and 30) are the address of the top left corner of the window. The ninth byte in line 130 (currently 12) is the number of rows scrolled and the eleventh byte in the same line (currently 22) the number of columns.

If the whole screen is to be scrolled. The top corner is 7168 ($1E00). The address bytes in line 120 become 0 and 30. The number of rows will be 23 and the number of columns 22.

To play the game use the A and Z keys to move the spaceship up and down. You must avoid the asteroids moving left to right either by moving or by firing a laser (* key).

**Scramble**
*by Alan Webb*

```
10 PRINT"INPUT DIFFICULTY....."
11 PRINT"1.....EASY"
12 PRINT"5.....HARD"
13 INPUT" ";AB%
14 IFAB%<1ORAB%>5THEN10
15 PRINT"PLEASE WAIT A MOMENT"
20 DATA 60,126,124,255,62,60,24,0
30 DATA 0,0,34,85,136,0,0,0
40 DATA 0,0,7,31,255,63,0,0
50 DATA 15,31,254,254,254,254,0,0
60 DATA 0,0,0,48,128,252,255,255
70 DATA 255,255,252,128,48,0,0,0
75 DATA 255,255,255,255,255,255,255,255
80 POKE51,00:POKE52,27:POKE55,00:POKE56,
   27:P=8021:LA=100
90 FORL=0TO511:POKE7168+L,PEEK(32768+L)
   :NEXT
100 FORL=0TO55:READX:POKE7936+L,X:NEXT
110 POKE36869,255
120 DATA72,152,72,138,72,56,169,220,133
   ,87,169,30,133,88,165,87,233,1,133
130 DATA89,165,88,233,0,133,90,162,12
   160,22,136,177,89,145,87,136,208
140 DATA249,169,32,145,87,24,165,87,105
  ,22,133,87,144,2,230,88,24,165,89,105,22
150 DATA133,89,144,2,230,90,202,208,
   217,104,170,104,168,104,96
160 FOPL=7000TO7072:READX:POKEL,X:NEXT
165 QQ=1000*(6-AB%)
170 LA=100:PRINT"":FORL=0TO506
   :POKE38400+L,6:NEXT
175 FOPL=7680TO7879:POKEL,27:NEXT
180 FOPL=0TO21:POKE7870+L,26:POKE8164+L
   ,25:NEXT
190 TI$="000000"
200 PRINT"ELAPSED TIME..";RIGHT$
   (TI$,4)
205 PRINT"HIGH TIME";HT
210 IFRND(1)<(TI/QQ)THENPOKE7900+INT
   (RND(1)*12)*22,21
220 K=PEEK(197):IFK=64THEN290
230 IFK=17ANDP>7921THENTW=-22:IFPEEK(P+
  TW)=32ANDPEEK(P+1+TW)=32THEN270:GOTO330
240 IFK=33ANDP<8145THENTW=22:IFPEEK(P+T
  W)=32ANDPEEK(P+1+TW)=32TNEN270:GOTO330
250 IFK=14ANDLA>0THENLA=LA-AB%:GOTO390
260 GOTO290
270 POKEP,32:POKEP+1,32:P=P+TW
280 POKEP,23:POKEP+1.24
290 POKEP,32:POKEP+1,32
300 IFPEEK(P-1)<>32THEN330
310 SYS7000:
320 POKEP,23:POKEP+1,24:PRINT""TAB(14)
  RIGHT$(TI$,4):PPINT"LASERS..      LA
  :GOTO210
330 PRINT"ELAPSED TIME..";RIGHT$
   (TI$,4)"MINS"
335 IFVAL(TI$)>HTTHENHT=VAL(TI$)
340 POKE198,0
350 PRINT"MORE?"
360 GETI$:IFI$=""THEN360
370 IFI$="Y"TNEN170
380 END
390 FORZ=1TO5
400 POKEP-Z,22:IFZ<3THENPOKEP,32:POKEP+
   1,32:SYS7000:POKEP,23:POKEP+1,24
405 NEXT
410 IFRND(1)<(TI/QQ)THENPOKE7900+INT
   (RND(1)*12)*22,21
420 FORZ=1TO5
430 POKEP-Z,32:NEXT
440 IFRND(1)<(TI/QQ)THENPOKE7900+INT
   (RND(1)*12)*22,21
450 GOTO210
    READY.
```

# Disassembling machine code

*David Angler presents a disassembler program for all 6502 machinas*

A disassembler is very useful for understanding other people's machine code and debugging your own. For example, I had written a plot routine in machine code and it kept crashing. After several days rewriting the code I found by using the disassembler that my original version had the wrong address modes in a certain region of the program.

The following program is very easy to implement disassembler for any computer with 2K of Ram and the basic commands *Read*, *Data* and *Restore*. It was originally written for a Vic20, but should run on any 6502 machine.

The program itself consists of two major loops. The outer loop fetches the opcode from memory at the address *Pc* and increments this each loop until *Pcmax* is reached. The inner loop then searches all the data statements for this opcode and, when it is found, takes the next bit of data which is a code for that opcode. Next it states the length of the instruction, including the operands and the address mode of that opcode for display purposes. Then the data is scanned for next * because the mnemonic of the opcode is after this.

The only machine-dependent instruction is at line three. The heart-shaped sign is a clear screen control code — replace it with any other command which does the same thing.

Lines 200-290 convert decimal numbers to *hex*, while lines 499-520 are opcodes and mnemonics, with address mode codes. Line 600 is the data for each type of address mode.

Improvements may consist of changing the program to print destination addresses of branches and ascii values etc. ■

```
2 GOSUB400
3 INPUT"JINPUT PC,PCMAX",PC,MAX
5 REM START OF LOOP
6 RESTORE
7 U=PEEK(PC)
8 IFU=0THENBY=1 OP$="BRK" M=0 GOTO50
10 FORI=1TO410
12 READ C$
14 IFVAL(C$)=U THEN 20
16 NEXTI
18 A=INT(PC/256) GOSUB200 A=PC-256*INT(PC
   /256) GOSUB200 PRINT" ?" PC=PC+1 GOTO6
20 READ M
24 REM READ TO MARKER
30 READ M$
32 IFM$<>"*"THEN 30
34 REM GET STRING
36 READ OP$
38 BY=ABS(M)AND3 M=INT(ABS(M/4))
50 A=INT(PC/256) GOSUB200 A=PC-256*INT(P
   C/256) GOSUB200
52 IFBY=1THENPRINT" "OP$A$(M,0), PC=PC+1
    GOTO 70
54 IFBY=2THENPRINT" "OP$A$(M,0), A=PEEK(
   PC+1) GOSUB200 PRINTA$(M,1); PC=PC+2
   GO TO70
50 IFBY=3THENPRINT" "OP$A$(M,0)  A=PEEK(
   PC+2) GOSUB200
59 IFBY=3THENA=PEEK(PC+1) GOSUB200 PRINT
   A$(M,1)  PC=PC+3 GOTO70
60 PRINT"BYTE ERROR" STOP
68 STOP
69 REM TEST IF DONE
70 PRINT
75 IFPC<=MAX THEN 6
100 PRINT"COMPLETE" STOP
199 REM HEX
200 R1=0 R2=0 V$="" A$="" B$=""
220 R1=INT(A/16)
230 R2=A-(R1*16)
240 IFR1<=9THENA$=CHR$(48+R1)
250 IFR1>9THENA$=CHR$(55+R1)
260 IFR2<=9THENB$=CHR$(48+R2)
270 IFR2>9THENB$=CHR$(55+R2)
280 V$=A$+B$ A=0
290 PRINTV$, RETURN
400 DIMA$(8,1) FORI=1TO410 READA$ NEXT
410 FORM=0TO6 FORI=0TO1 READA$(M,I) NEXT
   I,M RETURN
499 DATA105,-6,101,-26,117 -10,109,-27
500 DATA125,-11,121,-15,97,-34,113,-18,
   *,ADC
501 DATA41,-6,37,-26,53 -10,45,-27,61,
   -11,57,-15,33,-18 49,-22 *,AND
502 DATA6 -26,22,-14 14,-27,30,-11,10,
   -29 *,ASL,144,-26,*,BCC
503 DATA176,-26,*,BCS,240,-26,*,BEQ,36,
   -26,44,-27,*,BIT,48,-26,*,BMI
504 DATA208,-26,*,BNE,16,-26 * BPL,80,
   -26,* BVC,112,-26,*,BVS,24,-1,*,CLC
   216,-1,*,CLD
505 DATA88,-1 * CLI,184,-1,*,CLV,201,-6,
   197,-26,213,-10,205,-27,221,-11,217,
   -15,193,-18
506 DATA209,-22,*,CMP,224,-6,228,-26,236,
   -27,*,CPX,192,-6,196,-26,204,-27,*,CPY
507 DATA198,-26 214,-10 206,-27,222,-11,
   *,DEC,202,-1,*,DEX
508 DATA136,-1,*,DEY 73,-6,69,-26,85,
   -10 77,-27 93,-11,89,-15,65,-18 81,
   -22 *,EOR
509 DATA230,-26,246,-10,238,-27 254,-11,
   *,INC,232,-1,*,INX,200,-1 *,INY,76,
   -27,108,-35
510 DATA*,JMP,32,-27 * JSR,169,-6,165,-
   26,181 -10,173 -27 189 -11 185,-15
511 DATA161,-18,177 -22 * LDA 162,-6,166,
   -26,182 -14,174,-27 190,-15,*,LDX
512 DATA160,-6,164,-26,180,-10,172 -27,
   188 -11,*,LDY 70,-26,86,-10,78,-27,
   94,-11,74 -29
513 DATA*,LSR 234,-1,* NOP,9,-6,5,-26,21,
   -10,13,-27,29 -11,25,-15,1,-18,17,
   -22,*,ORA
514 DATA72 -1,*,PHA 8,-1 * PHP 104,-1 *,
   PLA 40 -1 *,PLP,38,-26,54,-10,46,-27,
   62,-11
515 DATA42,-29,*,ROL,102,-26,118,-10,110,
   -27,126,-11,106,-29,*,ROR 64,-1,*
   RTI 96,-1
516 DATA*,RTS,233,-6,229,-26,245,-10,237,
   -27,253,-11,249,-15,225,-18,241,-22,
   *,SBC,56,-1
517 DATA* SEC,248,-1,*,SED,120,-1,*,SEI,1
   33,-26 149,-10,141,-27,157,-11 153,-15
518 DATA129,-18,145 -22 * STA,134,-26,
   150,-14 142,-27,* STX
519 DATA132,-26 148 -10,140,-27 * STY,170,
   -1,* TAX 168,-1,*,TAY,152 -1,* TYA
520 DATA186,-1 *,TSX,138,-1 *,TXA,154,-1
   ,*,TXS
600 DATA" " #  " ",",X" " " ",Y",(,")
   " ( "),Y" ' " ,A, (,)

READY.
```

# Telescope file

*In part six of our extract from The Working Spectrum we continue adding modules/subroutines to the Unifile program, designed to enable a single program to cover a variety of filing tasks without the need for constant re writing every time a new use comes along*

**MODULE 7**

This module contains the special search routine mentioned last week

*Commentary*

Line 2940 C4 is the indicator used to show, on return to Module 6, whether the specified combination of characters has been found

Lines 2980-3010 C1 is first set equal to the start address of the entry under examination To C1 are added the indicators attached to the X items in the entry, thus making C1 now equal to the start address of the next entry Note that we are now talking about the start address of the next entry in the main file, not the next entry in alphabetical order

Lines 3020-3060 The entry is examined character by character for a match with the combination of characters specified in the search instruction

*Testing Module 7*

Enter a series of character combinations, some of which are present in the file and some which are not Do not forget to precede them with SSS

**MODULE 8**

This module gives the user the option of changing or deleting the entry presented to the module by the search function

*Commentary*

Lines 2050-2130 You may recall that in Module 4 new entries were constructed in the form of R$ In these lines a modified R$ is created made up of either items taken directly from the entry in the file, or of items input to replace the originals The original entry is then deleted from the file by calling up the subroutine at line 3130

Line 2140 If the user has not specified that the entry is to be deleted, the modified entry in the form of R$ is presented to module 5 which inserts it in the correct place

*Testing Module 8*

Full testing of this module must await the entry of the next module, but you can test that the module does display the selected entry item by item and that any changes entered are registered in R$ After displaying all the items of the entry the program will stop with the report 0 OK 2130 1

**MODULE 9**

When an entry is deleted from the file, it leaves a gap which must be filled The function of this module is to delete a specified entry by telescoping the file down over it The file is not moved entry by entry but in chunks of 1 000 characters

*Commentary*

Line 3170 This loop sets C1 to the start address of the next entry

Lines 3210 3260 This loop shifts 1,000 character chunks of the file downwards the length of the entry to be deleted, the first chunk starting at C1

Lines 3230 3240 If B$ had been mentioned on both sides of an equation — e g LET B$(C TO C + SHIFT − 1) = B$ (I TO I + SHIFT − 1) — a shadow of B$ would have been momentarily created and the program would have run out of memory

Line 3270 The pointer to the deleted entry is removed

Lines 3280 3350 All the entries which have been shifted down the file must now have their pointers amended since their start addresses are now different

*Testing Module 9*

Use the AMEND function to delete one or two items, then change the first items of some entries in such a way that they must be moved within the file After each change or deletion, use the SEARCH function to check that the file is still in the correct order If the tests are satisfactory the program is now complete

*Summary*

You have now completed the input of a substantial and complex program which I hope will be of use to you in a variety of circumstances More important than that, however you have learned a variety of techniques which will be of use to you in future programs which must handle large amounts of non numerical data in an economical way

You have learned how to structure packed data by the use of pointers and indicators You have seen how strings can be effectively used to store a limited range of numerical data You have a working example of the powerful binary search technique

Best of all it you have taken the trouble to understand what you have been entering you will have gained confidence that large and complex bodies of data can be processed without the whole thing degenerating into chaos — after all a major part of the art of programming is having the boldness to jump in and tackle applications which look hopelessly complicated coupled with the perseverance to follow the task through to the end

*Going Further*

If you have understood what you have entered you might like to tackle some of the following tasks

1 The program is deliberately written with few multi-statement lines Once the program is working it would be a good idea to try and shorten it by combining lines — you will learn a great deal about the strengths and weaknesses of multi statement lines
2. I have already mentioned that no use is made of the binary search in the actual search module Why not add another search instruction which refers only to the first item in each entry and which calls up the binary search routine to accomplish the search
3 The program as structured cannot cope with files or entries which have a variable number of items This type of structure is quite common e g recipe with the variable number of ingredients and instructions It is a fairly simple matter to alter the program so that it works on three items per entry but with the second item being subdivided into a number of sub-items The AMEND function should be capable of adding or deleting sub-items
4 The program makes no provision for sending entries to a ZX printer — this could be easily rectified ■

**UNIFILE Module 7**

```
2910 REM ************************
2920 REM SPECIAL SEARCH
2930 REM ************************
2940 LET C4=0
2950 FOR M=S TO N-1
2960 LET S=M
2970 LET C=PN R()
2980 LET C1=C
2990 FOR I=1 TO X
3000 LET C1=C1+CODE B$(C1)
3010 NEXT I
3020 FOR J=C+1 TO C1-LEN S$+E
3030 IF B$(J TO J+LEN S$-S1)<>S$(
S TO ) THEN GO TO 3060
3040 LET C4=1
3050 RETURN
3060 NEXT J
3070 NEXT M
3080 LET C4=0
3090 RETURN
```

**UNIFILE Module 8**

```
1920 REM ************************
1930 REM CHANGE ENTRY
1940 REM ************************
1950 LET S=S-1
1960 LET C=PN R()
1970 LET R$=""
1980 PRINT "ENTRY ";S-1
1990 FOR I=1 TO X
2000 GO SUB 2810
2010 GO SUB 2830
2020 PRINT AT 17,0; PAPER 5;"
AMEND"
2030 PRINT "COMMANDS AVAILABLE"
2040 PRINT ">ENTER    LEAVES IT
EM UNCHANGED">ZZZ    DELETES
WHOLE ENTRY">ENTER NEW ITEM"
2050 GO SUB 2700
2060 IF LEN B$=1 THEN LET R$=R$+
B$(C TO C+CODE B$(C)-1)
2070 LET C=C+CODE B$(C)
2080 CLS
2090 IF LEN B$=1 THEN GO TO 2120
2100 IF B$(2 TO )="ZZZ" THEN GO
TO 2130
2110 LET R$=R$+B$
2120 NEXT I
2130 GO SUB 3130
2140 IF B$(2 TO )="ZZZ" THEN RET
URN
2150 GO SUB 1500
2160 RETURN
```

**UNIFILE Module 9**

```
3100 REM ************************
3110 REM TELESCOPE FILE
3120 REM ************************
3130 LET C=PN R()
3140 LET SHIFT=1000
3150 LET C1=C
3160 LET C3=C
3170 FOR I=1 TO X
3180 LET C1=C1+CODE B$(C1)
3190 NEXT I
3200 LET C2=C1-C
3210 FOR I=C1 TO LEN B$-1 STEP S
HIFT
3220 IF LEN B$-I+1<SHIFT THEN LE
T SHIFT=LEN B$-I+1
3230 LET S$=B$(I TO I+SHIFT-1)
3240 LET B$(C TO C+SHIFT-1)=S$
3250 LET C=C+SHIFT
3260 NEXT I
3270 LET Y$=Y$(1 TO 2*(S-1))+Y$(
2*(S+1)-1 TO )
3280 FOR I=1 TO N-1
3290 LET S=I
3300 LET C=PN R()
3310 IF C<C3 THEN GO TO 3350
3320 LET C=C-C2
3330 LET Y$(2*I-1)=CHR$ INT (C/2
56)
3340 LET Y$(2*I)=CHR$ (C-256*INT
 (C/256))
3350 NEXT I
3360 LET P=P-C2
3370 LET N=N-1
3380 RETURN
```

# Repeated discovery

***Peter Chese** reveals some of the mysteries of the Dragon and presents Falling Invaders*

Since acquiring a Dragon 32 computer in September I have discovered a number of interesting things which are not in the manual *Peek* 65280 does more than contain the status of the joystick buttons It also contains useful information about the keyboard which allows repeat keys to be used

When a key is pressed it will contain a code which tells you which group of keys is being pressed I have used this to write a short program to produce keys that repeat after a short delay as on the Spectrum or BBC computers

**Autorepeat keys for Dragon**

```
10 CLS
20 PRINT CHR$(128)
30 K$=INKEY$ IF K$=" " THEN 30 ELSE PRINT
   CHR$(8) K$ CO=0
40 CO=CO+1 IF PEEK(65280)=127 OR
   PEEK(65280)=255 THEN 20 ELSE IF CO<18
   THEN 40
50 PRINT K$ IF PEEK(65280)=127 OR
   PEEK(65280)=255 THEN 20 ELSE 50
```

I should be very interested to hear if any readers have found other methods of producing repeat keys as my program requires that if two keys are within the same coding group then the first repeating key must be released before the second key is pressed

*Peek* 135 contains the ASCII code for the last key pressed

More colours can be produced in high resolution graphics *Pmode* 3 by taking two colours and colouring alternate pixels as on a chessboard, using *Pset* commands

The joysticks cannot be accessed at random, but only in the following combinations

a)JOYSTK(0) on its own
b)JOYSTK(0) and JOYSTK(1)
c)JOYSTK(0) JOYSTK(1) and JOYSTK(2)
d)JOYSTK(0) JOYSTK(1) JOYSTK(2) and JOYSTK(3)

If you wish to access only *Joystk*(3) for instance you must read the values of the other axes of both joysticks into dummy variables

In *Print* statements the Dragon does not require punctuation between items although the comma after *Print* @ is compulsory (see lines 30 and 40 in the *Falling Invaders* game)

The Dragon uses the 6809 microprocessor which is very versatile and relatively easy to program Unfortunately the Dragon manual gives no details of the 6809 coding although we are promised an assembler soon In the meantime it owners wish to experiment with machine code, I suggest they purchase a copy of the *Motorola 6809 Programmers Manual* (available from Lock Distribution tel 061 624 0333, price about £5 50 exc VAT)

**Falling Invaders**

Here is a short games program for the Dragon 32 which uses a machine code section to move the screen display Although a very simple game, it is challenging to play and can form the basis for more complicated games — for instance, by making the invaders fire back

The program contains all the necessary instructions when run You must stop the invaders from landing The game can be played from the keyboard or with a joystick For the joystick version, replace lines 30 40 210 and 220 as shown

```
10 CLS0 PRINT "FALLING INVADERS"
20 PRINT @ 64, "STOP THE ADVANCING ALIENS "
30 PRINT @ 128,CHR$(34) "A CHR$(34)"=LEFT"
   CHR$(34)' O "CHR$(34)"=RIGHT
40 PRINT @ 192,CHR$(34)"SPACE "CHR$
   (34)"=FIRE MISSILE "
50 PRINT @ 416, "HIT A KEY TO BEGIN            ",
60 IF INKEY$="" THEN 60
100 CLEAR 300 ,32000 PLAY"T20O1V10"
110 FOR I = 0 TO 31 D$=D$+CHR$(128) NEXT
120 FOR I = 32000 TO 32049 READ P$  POKE I,
    VAL("&H" +P$) NEXT
130 DATA CC 0,C0 10 8E,5,61 CE,5,A1,4C,
    AE,A3 AF,C3 5A,26 F9,4A,26,F6 12
140 DATA 86,0 10,8E,7D,64,A7,A4,8E,5,61,A6,60,
    61,80,26,6,8C,5,9F,2F,F5 39 86 1,A7 A4 39
150 CLS0 B=449 D=50 S=0 OB=B-1
160 FOR I=0 TO 5
170 I$(I)=CHR$(134+16*I)+CHR$(143+16*I)
    +CHR$(137+16*I)"
180 NEXT
190 FOR I = 1 TO 7 PRINT @ I*32+RND(29),
    I$(RND(6)-1), NEXT
200 FOR I=0 TO D IF OB<>B THEN PRINT @ OB-1,
    STRING$(3,128), PRINT @ OB-32,CHR$(128),
    PRINT @ B-32,CHR$(159), PRINT@
    B-1 I$(1), OB=B
210 K$=INKEY$ B=B+(2*(K$="A "AND
    B>449))-
    (2*(K$="D "AND B<477))
220 IF K$=" "AND M<=0 THEN M=B-64
    PLAY"O4CO1"
230 IF M<00 THEN 270
240 IF M<32 THEN PRINT @ M,CHR$(128),
    M=-1 GO TO 220
250 PRINT @ M,CHR$(128),
260 M=M+(32*(M>31)) IF PEEK(1024+M)<>128
    THEN PRINT @ INT(M/32)*32,D$, M=-1 S=S+
    10 PRINT @ 400," SCORE ";S, PLAY"O3CO1 "
    ELSE PRINT @ M,"*";
270 NEXT
280 IF M>32 THEN PRINT @ M,CHR$(128),
    M=M+32
290 EXEC 32000
300 PLAY"C"
310 IF PEEK(32100)=1 THEN 350
320 IF D>8 THEN D=D* 95
330 PRINT @ RND(28)+32,I$(RND(6)-1),
340 GO TO 200
350 PRINT @ 0,"GAME OVER        ", IF S>HS THEN
    HS=S
360 PRINT"HIGH SCORE  ,HS
370 PRINT @ 42,"HIT ENTER",
380 IF INKEY$<>CHR$(13) THEN 380
390 GO TO 150
```

**For movement by joystick**

```
30 PRINT @ 128  MOVEMENT BY RIGHT
   JOYSTICK'
40 PRINT @ 192  RIGHT BUTTON FIRES"
210 J=JOYSTK(0)-32.D1=SGN(J)*
    (  2*(ABS(J)>13)) IF B+D1<479 AND
    B+D1>448 THEN B  B+D1
220 IF (PEEK(65280)=126 OR PEEK(65280)=254)
    AND M<=0 THEN M=B-96 PLAY  O4CO1"
```

# A broken promise

*Last week we looked at a subroutine which acted as a Z80 multiply instruction. Working in 8-bit registers for the sake of simplicity, we explained how to shift left and right while multiplying in binary*

Note that we did not assign actual addresses to the program, but simply started at zero. This is because all the jumps are relative, so actual addresses are unimportant — only displacements matter. For example, with 16K you can replace all 43s in last week's program by 7Fs, to work with a 256-byte attic.

You will also need to *output* the answer — at the moment it's just sitting in the *A*-register. A simple way to do this is to stick the answer into the display file by adding the following code at the end, *in place of* the *C9 (Ret)* instruction, which is there only because we said this was going to be a *subroutine*

```
0013    LD HL (D-FILE)    2A 0C 40
0016    INC HL            23
0017    LD (HL) A         77
```

Add this at the end, add the bytes 07 and 08 at the front (or *Poke* them later) and enter using *Loader* with 2 data bytes. The letter '*S*' will appear at the top corner of the screen. The code for *S* is 56 — and that's the product of the two numbers 07 and 08 you *Poked* in. Of course a more elegant display routine would be nice: think about *Print Usr*. But for a test, this method suffices.

Now, we have a confession to make. There is an easier way of testing to see if the junior bit of *E* contains 1. There is an instruction *Bit 0, E* which does the job. So

```
LOOP  LD L, A     6F
      LD A, C     79
      AND A, E    A3
```

becomes just

```
LOOP  BIT 0 E     CB 43
```

and the *Ld A, L* has to disappear as well.

Why didn't we tell you that in the first place? Well, firstly, we promised to use only the subset of instructions in the table, a promise we have now broken. But we have made an important point in the process — that it is possible to do things satisfactorily without knowing the full instruction set.

Reproduced from ***Machine Code and better Basic***, **by Ian Stewart and Robin Jones (price £7.50), by kind permission of Shiva Publishing Ltd, 4 Church Lane, Nantwich, Cheshire CW5 5RQ**

**If you have any machine code subroutines/tips/games, please send them to: Machine Code, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF**

So now for something more clearly useful. Fed up with Basic ability to draw graphics lines at a snail's pace? Let's see if we can write a machine code subroutine which will draw straight lines from any point on the screen running horizontally, vertically or diagonally. At least, that's the target.

Let's deal with the problem in easy stages. Obviously, we need to know something about how the ZX81 handles displays before we can get anything on the screen. As you have probably seen from the *manual*, there is an area of memory called the *display file* from which the screen display is generated. All we have to do is store character values in this region to get them displayed.

The position of the display file is not fixed (it depends on the program size). There is, though, a pointer to its first byte, called *D-file* which has the hex address 400C, decimal 16396. So the display file starts at *Peek* 16396 + 256**Peek* 16397.

The size of the display file is not fixed either (at least it isn't on 1K systems, and although it normally is on 16K systems this is not guaranteed). The display file begins with a newline character, and ends every line with one as well. So, for instance, the state of the display file after the following statements

```
10 CLS
20 PRINT "ABC"
30 PRINT "□□□DEF"
```

would be

```
<ABC<□□□DEF<<<<<<<<<<<<<<<<<<<<<<
```

in 1K, or in 16K if Ramtop has been lowered to under 3¼K. With more than that size of memory, it will be padded out with the "missing" blank spaces (we are using "<" to represent *Newline* and "□" to represent *space*).

This is a neat way of saving precious memory when only a small part of the screen is being used, but it does not make our problem any easier.

Let's try something simple, like putting a graphics symbol at the top left-hand corner of the screen. If the screen is blank to start with, there will just be 25 newlines in the display file. So our problem is to overwrite the second of them (where the "A" is in the above example) with our chosen symbol.

First, Load *HL* with a pointer to the display file. This is *D-file* which is at 400C hex

```
LD HL, (400C)        2A 0C 40
```

Now bump *HL* to point to one character further along

```
INC HL               23
```

Next put the graphics character (88 hex, say) in the *A* register

```
LD A 88              3E 88
```

and finally, put this value where *HL* is pointing

```
LD (HL) A            77
```

This works OK, but we should think carefully before extending the idea. After all, we have just overwritten one of the newlines, which is doubtless being used by one of the ZX81's system routines to handle the display. Sooner or later we will confuse that routine if there are not enough newlines left for it to play with. Of course, if we are overwriting a character that is already in the display, this problem does not arise. So, for instance, we could change the *A*, *B* or *C* of the first example without affecting the newlines at all.

One way out of the problem, then, is to fill with spaces the portion of the screen we are interested in. On a 16K machine with Ramtop above 3¼K, *CLs* does this, creating 24 lines of 32 spaces each. On a 1K machine we could write

```
10 FOR L = 1 TO 5
20 FOR C = 1 TO 30
30 PRINT "□";
40 NEXT C
50 PRINT
60 NEXT L
```

to set up the top 5 lines to spaces.

Now for something more ambitious. Bored with the same old display all the time? How about white-on-black? We will write a routine to invert the display file. The principle is simple: run through it changing each character to its inverse, except for *Newlines*. For comparison, here it is in Basic

```
10 LET D = PEEK 16396 + 256*PEEK 16397
20 LET B = 22
30 LET D = D + 1
40 LET P = PEEK D
50 IF P = 118 THEN GOTO 100
60 POKE D, P + 128 - 256*(P>127)
70 GOTO 30
100 LET B = B - 1
110 IF B = 0 THEN STOP
120 GOTO 30
```

Type this in, set up a nice display, and run the beast. Yes, well, it's a bit *slow*, isn't it? A machine code version ought to be faster. The machine code follows a very similar pattern to the Basic program.

```
0000        LD B, no. of lines    06 16
0002        LD HL, (D FILE)       2A 0C 40
0005  LOOP  INC HL                23
0006        LD A, (HL)            7E
0007        CP A, newline         FE 76
0009        JRZ SKIP              28 05
000B        ADD A, 128 dec        C6 80
000D        LD (HL), A            77
000E        JR LOOP               18 F5
0010  SKIP  DJNZ LOOP             10 F3
0012  (tack on standard ending via LOADER)
```

The addresses are relative ones: load this up as usual with the *Loader*. Now set up a Basic routine to print out a nice display, and call the above machine code via *USR*. Now it's very fast indeed! Note how the machine code mnemonics parallel the Basic. And a bonus in machine code: to invert video, add 128 (hex 80) to the code. Do not worry about going over 256, because the extra carry digit just drops off the end of the register. (NB with 1K, not all of the display gets inverted. Why not? Which bit does?) ■

**Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, *PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF**

## WIRING UP FOR TURKISH SYSTEM

*Osman Ardah of Istanbul, Turkey, writes*

**Q** **Because the ZX81 is not available in Turkey, I recently bought one in France. Unfortunately, it would not work on my television at home. The system here is the same as that in England except that it is VHF not UHF, but that is not the problem as I have a German set that is capable of receiving UHF**

**Looking at the pcb, I can see that it has wiring facilities for England, France and the USA. All I need to do is rewire it from French to English mode. I suspect that all this entails is to invert the video signal, but I have not got a circuit diagram to do this. I wrote to Sinclair but they were not much help and advised me to contact the French distributor. But they cannot help either because the system I want to use is the English one. Can you supply the details?**

**A** Do not worry about the reaction you get from Sinclair. Customers in this country are used to the delay and sometimes inappropriate response that they get from Cambridge. To be fair to Sinclair, as you have got your computer from a dealer, then they are strictly speaking correct in referring you back. But with the ZX81 travelling all over the world now, a little extra help might not come amiss from time to time.

All the ZX81s have the same ULA, but there are modifications in the video lead. In the US model a resistor and a diode have been added, while in the French model a small two-transistor circuit has been added, which is clearly marked on the pcb. To convert your computer back to the UK mode, you will have to run a wire direct from the video output, to the spot marked UK1 on the pcb, thus by-passing the added circuit, which you must then take out by simply cutting the components out. This will return you to PAL B UHF which should then be compatible with your German television set.

## TUNING IN WITH A MATCHSTICK

*K Ayre of Park Road, Hartlepool Cleveland writes*

**Q** **I received my Spectrum after 11 weeks of waiting and am very pleased with its capabilities and its keyboard, despite what other people might say about it. But, after being switched on for one to one and a half hours the colours start to flicker and soon the display goes black and white. It also becomes very hot around the speaker (where the heat sink is located). The colours change even more easily when the *Beep* command is used.**

**I wrote to Sinclair about a month ago, but so far I have had no reply. I would be very grateful if you could help me out**

**A** Some problems with the Spectrum, such as overheating, are beginning to make themselves apparent. In some cases this is bad enough to cause decay of the memory, though I do not think this is true in your case.

It could be that the tuning of the colour output from the computer itself is slightly off, the problem only becoming apparent when it is aggravated by overheating. On the underside of your Spectrum you will see a couple of very small holes, at the bottom of which is a very small brass screw. The one nearest the keyboard will need careful adjusting. It is important that you only make small adjustments, as it would be easy to make the picture worse, not better. It is also advisable to use a small piece of wood instead of a metal screwdriver. A matchstick which has one end specially cut to fit the slot of the screw would be ideal.

## RE-WRITE THE WRAPROUND

*R Yeardly of Doncaster Yorkshire, writes*

**Q** **I have recently tried to write some software on my BBC micro, with a sideways screen scroll. I tried using *Vdu* 23;13 number 0;0, statement, but this scrolls with a wrapround effect. I wanted the left-hand edge to disappear and new information to appear on the right-hand edge. Can you suggest a way of doing this?**

**A** Essentially what you have to do is re-write the wrapround. This will mean clearing the last column as it disappears off the edge of the screen and writing new information on it. Thus when it appears on the other side of the screen with the new information, it will give the appearance of movement. *Vdu* 23,13 is a carriage return so it would be best to re-write the new information before this command is executed. Without seeing the routine I cannot tell you how to actually incorporate it into your program.

## YES, TO THE THEORY NO, IN PRACTICE

*Ian Watts of Queen Street Middleton Cheney, Oxfordshire writes*

**Q** **I was looking at the Spectrum 'Specs' in Uncle Clive's literature and saw the magic phrase 'User software can generate 40 characters per line, or other settings.' "Wow" I thought, "surely 320 x 192 pixels." Not so, according to Clive, or any one else for that matter. Is it possible? Is there a magic *Poke* that will enable me to use this setting, indeed are there any other settings that can be *Poked* or does it require a complete program?**

**A** It can be done, but only by fiddling the character set. What you need is to redefine the character set into a 5 x 7 format. That would allow 40 characters across, with one byte of space at each end, to act as a margin (each character would be defined on a 6 x 8 grid with the last column and the eighth row left clear for spacing between individual characters).

In theory, if you only wanted your characters to be one bit wide, you could have a 128 x 24 display. But whatever the definition of your set, you would then have to place each character on the screen using *Print at* and *Over*. To the best of my knowledge, there is no program available to do this.

## WIRING UP TO A MONITOR

*M R Hildyard of Wodeland Avenue, Guildford Surrey, writes*

**Q** **I would be extremely grateful if you could clear up the following questions. Would it be possible to reduce the 'dot crawl' on my ZX Spectrum (48K) if it was hooked up to a colour monitor of some sort? If so, how could this be achieved, and what particular type would you recommend?**

**I do not think that my computer is damaged, as other Spectrums that I have seen, seem to suffer from similar problems.**

**A** Yes, if you hooked your Spectrum up to a colour monitor then there would be a significant improvement in the quality of your screen display. Most computers tend to wander off channel 36 a little, so you might find that careful retuning each time, before using your computer, will help.

If you do wire up your computer to a monitor, remember that the braided part of the lead is connected to the case of the modulator, which is the outer part of the connector. The inner part of the cable is connected to the inner pin of the lead.

I cannot recommend any one particular type of monitor though obviously you would want a colour one. The best think you could do would be to look at the various monitors being advertised and find out which you think best suits your pocket and your needs. For example, do you want a simple monitor or a combined television/monitor? The latter is considerably more expensive.

You are correct in assuming that dot crawl is not the sole prerogative of your Spectrum. Other Spectrums and other micros, also suffer from it.



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# Ziggurat



## The nth generation

At times I feel like that famous pioneer of psychoanalysis Dr Helmholtz Dr Helmholtz you may recall was a marvellous amateur violinist although he could not read music and could only play one note (*Getting Even* by Woody Allen)

If we have a fifth generation of computers, we must have had four previous generations So 'What is a generation? Given that faculty hindsight, it is possible to make sense of history, to see patterns, to see generations

Marvin Harris (*Cannibals & Kings* 1977) points out that Retrospectively scientists can readily reconstruct the causal chain of adaptations that led from fish to reptiles to birds But what biologist looking at a primitive shark could have foreseen a pigeon?

Computers have certainly changed They have become smaller faster cheaper and internally more capacious This is obvious When observers look back, they discern differences in style of computers and many find four different styles — the so-called four generations of computers.

As with many things it is worthwhile to try to work out for oneself what exactly are the four generations As we are talking about the *interpretation* of history there are no right or wrong answers — it is just that some interpretations are more convincing or persuasive than others. As the Japanese are the keenest to develop the fifth generation of machines I will first give a Japanese opinion of what are the four generations of computers

Susumi Aizawa the senior managing director of Epson (producer of the new portable HX20 microcomputer), has said that Japan would be in the forefront of the "fourth evolution of computers" Mr Aizawa identified the first evolution as the big main frame computers pioneered by IBM, the second evolution as the mini computer (eg DEC), and the third evolution as the microcomputer (eg Apple)

He felt that each generation had managed to produce a smaller cheaper product capable of doing the job originally designed for the previous generation The views of Mr Aizawa, coming as they do from the managerial elite of an important firm make interesting reading, because his views are at variance with the commonly accepted version of what are the four generations Either the bosses do not really know what is happening or they see it in a different way

The usual version of the identity of the four generations — valves then transistors then integrated circuits and now large-scale integrated circuits — concentrates on the technology with the size of the computer being a *consequence* of the technology and the form of the circuitry being of prime importance Though these are the normally accepted definitions I find the transition between generation three and generation four to be unconvincing

I can see that valves are a dramatically different form of technology from transistors, and that single transistors are very different from integrated circuits Surely however the point at which an integrated circuit becomes a large-scale integrated circuit is less obvious In fact what Mr Aizawa was considering are levels and degrees of large-scale integration that is gradations within what others call the fourth generation

The fifth generation of course is *going* to be something completely different (a pigeon from a reptile perhaps?) and the emphasis in the development of the new generation is towards a radical change in software

In the history of computers has anything really changed other than size? I wonder ■

**Boris Allen**

# Puzzle

## A golden rule of squares and infinitum

**Puzzle No 36**

The golden ratio is a value that has been known from antiquity both as a mathematical curiosity and as a valuable ratio in the world of art. A rectangle with sides in this ratio is considered to be the one most pleasing to the eye If a square is cut from one end the remaining piece is also a 'golden rectangle This procedure can be repeated ad *infinitum*

The value of the golden ratio can easily be found as it is the only positive number that becomes its own reciprocal by the addition of 1 Try the following program

```
10 INPUT X 20 LET X = 1/X. 30 SCROLL 40
PRINT X. 50 LET X = X + 1 60 GOTO 20
```

Whatever number you input the values of *X* printed converge on the golden number

The golden number can also be found by taking any two consecutive numbers in what is called the Fibonacci series and dividing the first by the second The Fibonacci series starts with zero and one — each successive term is the sum of the preceding two — 0 1 1 2

Using the Fibonacci series find the value of the Golden Ratio to eight decimal places and show that the value is stable to that accuracy The larger the pair of numbers in the series used to find the golden value the more accurate will be the result

# Top 10

**Atari**

| | | | |
|---|---|---|---|
| 1 | (3) | Preppie | (Adventure International) |
| 2 | (1) | Jumbo Jet Pilot | (Thorn EMI)* |
| 3 | (2) | Submarine Commander | (Thorn EMI) |
| 4 | (7) | Air Strike | (English Software) |
| 5 | (—) | Snooker and Billiards | (Thorn EMI) |
| 6 | (—) | Darts | (Thorn EMI) |
| 7 | (—) | Scott Adams Adventures | (Adventure International) |
| 8 | (—) | Star Flight | (Adventure International) |
| 9 | (—) | Centipede | (Atari)* |
| 10 | (10) | Alien Swarm | (Inhome Software) |

*Cartridge
(Figures compiled by Calisto Computers, Birmingham 021 632 6458)

**ZX81**

| | | | |
|---|---|---|---|
| 1 | (5) | Mazogs | (Bug-Byte) |
| 2 | (2) | 3D Defender | (JK Greye) |
| 3 | (4) | Frogger | (DJL Software) |
| 4 | (1) | Mazeman | (Abbersoft) |
| 5 | (7) | Gulp II | (Campbell Systems) |
| 6 | (9) | Gauntlet | (Colourmatic) |
| 7 | (8) | Flight Simulator | (Psion) |
| 8 | (6) | Adventure 1 | (Abbersoft) |
| 9 | (10) | Chess | (Artic) |
| 10 | (—) | Sea War | (Panda Software) |

*All 16K
(Figures supplied by Buffer Micro Shop London 01 769 2887)

**Spectrum**

| | | | |
|---|---|---|---|
| 1 | (—) | Time Gate | (Quicksilva) |
| 2 | (—) | Orbiter | (Silversoft) |
| 3 | (1) | Escape | (New Generation) |
| 4 | (2) | Mazeman | (Abbersoft) |
| 5 | (—) | Space Intruders | (Quicksilva) |
| 6 | (—) | Adventure 1 | (Abbersoft)* |
| 7 | (10) | Espionage Island | (Artic) |
| 8 | (—) | Football Manager | (Addictive Games)* |
| 9 | (4) | Meteor Storm | (Quicksilva) |
| 10 | (—) | Master File | (Campbell Systems)* |

*Requires 48K
(Figures compiled by Strike Micro Shop, London 01 769 2887)

**Vic20**

| | | | |
|---|---|---|---|
| 1 | (4) | Grid Runner | (Llamasoft) |
| 2 | (5) | Defenda | (Llamasoft)† |
| 3 | (—) | Traxx | (Llamasoft)† |
| 4 | (—) | Abductor | (Llamasoft) |
| 5 | (—) | Sargon II Chess | (Commodore) |
| 6 | (1) | Adventureland | (Commodore) |
| 7 | (—) | Jellymonsters | (Commodore)* |
| 8 | (—) | Myriad | (Rabbit) |
| 9 | (7) | Blitz | (Commodore) |
| 10 | (—) | Spiders of Mars | (Audiogenic)* |

*Cartridge †Requires 3K or 16K
(Figures compiled by the Vic Centre London 01-992 9904)

**Books**

| | | | |
|---|---|---|---|
| 1 | (—) | Spectrum Machine Language For the Absolute Beginner *Tang* | (Melbourne House) |
| 2 | (7) | BBC Micro Revealed *Ruston* | (Interface) |
| 3 | (3) | Z80 Assembly Language Programming, *Leventhal* | (Osborne) |
| 4 | (5) | Programming the 6502 *Zaks* | (Sybex) |
| 5 | (1) | ZX Spectrum Explored *Hartnell* | (Sinclair Browne) |
| 6 | (4) | Machine Code and Better Basic *Stewart and Jones* | (Shiva) |
| 7 | (6) | Vic Innovative Computing *Ramshaw* | (Melbourne House) |
| 8 | (8) | The Working Spectrum *Lawrence* | (Sunshine) |
| 9 | (—) | ZX Spectrum and How to Get the Most From It *Sinclair* | (Granada) |
| 10 | (9) | Starting Forth *Brodie* | (Prentice Hall) |

(Figures compiled by Watford Technical Books Watford 0923 23304)
(Last week's position in brackets)

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